

Seeing Through

Clare Mac Cumhaill

Submitted for the degree of PhD by Research
The University of Edinburgh
2011

I have read and understood the University of Edinburgh guidelines on plagiarism. This thesis was composed by me and is entirely my own work except where I indicate otherwise by use of quotes and references. No part of it has been submitted for any other degree or professional qualification.

Clare Mac Cumhaill

30/7/12

Abstract

This thesis explores and defends the idea that empty space is both visible and tangible – we see and feel it. In particular, it is argued that empty space looks ‘clear’ and ‘see-through’. Naturally, this requires a defense of the claim that empty space is something, not nothing, and this is the first task the thesis takes up. Chapter One motivates metaphysical Absolutism as an assumption, while Chapter Two defends the thought that empty space, understood absolutely, is not inefficacious – it has a kind of structural ‘biff’ that arises from its shape and which affects light and material located in and moving through it. This, it is argued, has consequences for perception, and these are worked out in Chapters Three and Six. Drawing on the work of Graham Nerlich, it is argued that empty space has a ‘look’ and a ‘feel’. Unlike Nerlich, however, it is insisted that *Euclidean* space is visible and tangible. Chapter Four asks in what sense the perception of a given empty region depends on that region – since empty space has a kind of biff, it is not negatively efficacious – while Chapter Five develops this theme in arguing against treating the perception of empty space as a species of absence perception. In this chapter, an alternative treatment of the perception of empty space is considered – the Structural View defended by Richardson (2010) and Soteriou (2011). This view emphasizes, not the structure of space, but the structure of experience. It is shown in what sense the ‘direct’ account so far defended is compatible with the structuralist position, where this is read descriptively, not transcendently. Chapter Seven traces a speculative line of argument by considering the seeing of space in mirrors and figurative paintings, while Chapter Eight explains where the structuralist and direct views diverge. It is argued, after Husserl (1907), that empty space and objects are *co-seen*, but that this is so in two distinct respects. Seeing empty space as space that objects could take up involves seeing objects as space-takers. But there could well be perceivers who see the ‘look’ of empty space without yet seeing empty space as space that could be filled.

Contents

Abstract	p. 3
Preamble	p. 5
i. Unoccupied Places.....	p. 14
ii. Efficacious Emptiness.....	p. 40
iii. Clearing the Ground.....	p. 64
iv. Gaps, Traps and Paths.....	p. 98
v. Looking for Nothing.....	p. 118
vi. Touching Empty Space.....	p. 147
vii. Specular Space.....	p. 174
viii. Taking Up Space.....	p. 197
Conclusions	p. 221
Bibliography	p. 223
Acknowledgements	p. 233

Preamble

Empty space is puzzling. Is it something or nothing? Does it *do* anything? Can we perceive it? Historically, many philosophers have treated these questions as interwoven, their conclusions varying in accordance with which question is answered first.

For Bishop Berkeley, for example, *esse est percipi*, and since we don't perceive empty space (evidently, he supposed), it is nothing at all. It is no thing.¹

Not dissimilarly, Hume supposed empty space a potential embarrassment, at least for the empiricist. We have a conception of void or vacuum, but from whence does such an idea come? Ideas are distilled from sensory impressions, but empty space is entirely *insensible*. So how, then, can we think of it?²

Perhaps surprisingly, even Newton agreed; empty space is imperceptible.³ Still, he insisted, it has effects - it *does* something. Consider a bucket of water suspended by a rope. When the bucket spins, the water tends to cleave to its sides, a hollow forming in the centre of the water as it swirls (just as it does when wine is whirled in a glass). It seems that the water is moving, but, argued Newton, it can't be moving *relative* to the bucket - after all, it is moving *because* the bucket is. Rather its movement is relative to absolute space, space that exists entirely independently of objects and that is itself motionless. Not all, however, were convinced. Among the more famous dissenters was Ernst Mach. Why appeal to empty space, he complained. If the same effects can be explained by considering only objects and their spatial relations, even

¹ In the *Principles of Human Knowledge*, he writes: "When I excite a motion in some part of my body, if it be free or without resistance, I say there is Space; but if I find a resistance, then I say there is Body, and in proportion as the resistance to motion is lesser or greater, I say the space is more or less pure. So that when I speak of pure or empty space, it is not to be supposed that the word "space" stands for an idea distinct from or conceivable without body and motion" (paragraph 116. 1910, p.124). Thanks to Alasdair Richmond for this reference.

² Still, he insisted, we need never be "embarrass'd" so long as we confine our speculations to the appearances of objects to our senses (see footnote from the Appendix to Book III of the *Treatise*, inserted in 1969, p. 112). Hume's solution to this puzzle is to argue that space is a manner of appearance. For an excellent critical account of Hume's treatment of space see Frasca-Spada (1998, pp. 56-82).

³ See Earman 1970, p. 288.

those as big as planets and stars, why suppose that empty space exists at all? If it has no explanatory function, why posit it? Where Berkeley argued from a failure to perceive, Mach argued from a failure to explain.⁴

So here, then, we can sort amongst two distinct threads of thought concerning the perception of empty space, or rather failure to perceive it, entangled in the history of ideas:

On the Berkeleyan/Machian tack, since we don't perceive space, or since it doesn't explain anything, we shouldn't posit its (idle) existence. For the Newtonian however, because empty space has explanatory consequences, it *is* something, even though it is imperceptible being insensible. For such an absolutist, the perceptual and sensible are identified.

Notice, then, that on both arguments it is just *assumed* that we don't perceive empty space. A third strand, one that can be found in philosophical theories of perception, aims to explain why. Empty space is inefficacious, and because we explain perceptual episodes causally – what is perceived is whatever causes itself to be perceived – empty space is not seen.⁵ Here, then, not one but *two* assumptions are in play. Empty space is something and it is inefficacious. Hence our failure to see it. We can catch a glimmer of this two-fold assumption in José Luis Bermúdez's discussion of holes:

“Holes are an intriguing case...There is an obvious sense in which holes cannot be perceived. If as is overwhelmingly plausible, perception involves a causal relation between perceiver and the object(s) of perception, then holes cannot count as objects of perception for the simple reason that they have no causal powers”.
(2000, p. 367)

⁴ For a less abbreviated description of this dispute see Dainton (2001, pp. 151-180).

⁵ This strand might be considered Lockean. In *An Essay Concerning Human Understanding*, Book II, viii, sections 5-6, Locke considers the perception of privations, concluding “in truth it will be hard to determine whether there be really ideas from a privative cause” (1991, p. 57). See also the discussion in Casati and Varzi (1994, pp. 156-158).

Notably, then, all three positions converge on the opinion that empty space⁶ is imperceptible, either because it is non-existent or, being something, because it is insensible or inefficacious. But such agreement is hardly universal. For example, in a well-known passage, M. G. F. Martin introduces into the stock of examples idiomatic in philosophy, among them barns and tomatoes, the case of the Polo mint:

“Consider the case of looking at a ring-shaped object, a Polo mint, for instance, head on. One is aware of the various white parts of the mint arranged in a circle, and aware of how they are related to each other. One is also aware of the hole in the middle of the mint, and that that hole is there in the middle. If one was not aware of the hole one would not see the mint to be a ring-shape rather than a circle”. (1992, p. 199)⁷

Even so, though we may happily grant that we can see holes (or Polo mints), the suspicion that may have prompted Berkeley *et al* – not that empty space is non-existent but that it is imperceptible – is not so easy to dispel. For although the notion that we fail to perceive empty space is, in one sense, phenomenologically off-key, by the same token we are apt to deny that we see anything that doesn’t have any observable colour or shape. For what would we thereby see? Yet in this equivocation we are in good company. Even Edmund Husserl wavered in coming to finally concede that we do, after all, perceive what he called ‘between-ness’. In his 1907 Lectures *Thing and Space*, he writes:

“The “between” as empty, though continuously fillable, space, as the mere possibility of real intermediaries characterised in a lawfully determinate way, is what we would thus have here, although we cannot say that empty space would be seen”. (§76, lines 24-27, 1997, p. 223)

However, in an appendix to §76, written in 1909, he rejoins:

“Is not the respective relief in visual space... precisely a mere relief, a mere, incompletely closed surface, such that the “between” is not

⁶ Here, for expediency, I treat holes and regions of empty space interchangeably. Later I sort between empty particulars, such as holes, and empty space in general, or, as I call it, mass-quantified empty space.

⁷ It might be noted that Martin says only that we are *aware* of the hole. On a certain understanding of ‘awareness’, then, this may not be incompatible with Bermudez. See the discussion in Chapter Seven of this thesis.

perceived? Indeed, this is obviously incorrect". (lines 8-12, *ibid.*, p. 323)

And later:

"with a little honesty, which, to be sure, is not easy to come by, we cannot escape the thought that we see the "between" and the entirety of space". (*ibid.*, lines 22-24)

But if *Husserl* was phenomenologically puzzled in the face of empty space, it is hardly surprising (and no indictment) that metaphysicians, in asserting its imperceptibility, have proved such bad phenomenologists, something that Ingvar Johansson wages (though granted of empiricists) in his *Ontological Investigations*.⁸ What, though, of the philosopher of perception?

Mostly, philosophical *arguments* for the imperceptibility of empty space, that is, where it is not simply assumed that empty space is imperceptible, have spun from metaphysical premises. So take the argument gestured at above:

- (i) Empty space is inefficacious
- (ii) Perception is explained causally
- (iii) Empty space is not seen

Here a conclusion about perception – one that has phenomenological import – is drawn from a metaphysical premise. Since, however, we might have reason to doubt the conclusion (as *Husserl* appeared to in 1909), we have reason too to question the premises. Yet equally since it seems that we can *merely* doubt the conclusion – as I said phenomenology itself is not entirely conclusive – this gives additional reasons to revisit metaphysics, specifically, and perhaps perversely, as a way of trying to clarify phenomenology. This, then, is the strategy I adopt.

In this thesis, I take an argumentative path that flows from metaphysics, but which, as I see it, nonetheless honours phenomenology and, critically, the ambivalence that

⁸ He writes: "Empiricists have always been bad phenomenologists. Obviously, we do perceive spaces between things as empty, at least normally, i.e. when it is not misty. Empty space is in this sense very much a perceivable category" (2004, p. 153).

introspective reflection on the phenomenology of perceiving empty space seems to spark. But this in turn allows me to say something about the nature of the causal dependency involved in perceiving empty space and, in particular, it allows me to establish whether granting that empty space is perceived must involve appeal to negative causation. The first part of the thesis then tracks the trefoil set of questions sketched at the outset: those concerning the being of empty space – *is it something?* – its efficacy – *does it do anything?* – and its perception – *can we perceive it?* I return a positive answer to all three:

In the first chapter, ‘Unoccupied Places’, I ask whether empty space is something or, as the skeptic would have it, nothing. For the skeptic – the traditional metaphysical relationist – what we *call* ‘empty space’ is just the possibility of objects taking up certain spatial relations. I give reasons against embracing this skeptical hypothesis and taking up instead the absolutist’s invitation to realism. If empty space turns out to be inefficacious, its inefficacy is not, we might assume, the inefficacy of unicorns.

Of course, it makes no sense to ask if empty space is efficacious if empty space is non-existent. For certain theorists, though, efficacy is the mark of being. Such theorists subscribe to what Armstrong (1997, p. 41) calls, after the Eleatic Stranger in Plato’s *Sophist*, the Eleatic Principle.⁹ On such a principle, the only entities that exist (or belief in the existence of which is justified) are those that have causal powers. In Chapter Two, ‘Efficacious Emptiness’, I show that empty space can satisfy the stranger’s demands; an argument can be raised in favour of the efficacy of empty space, albeit one that trades on a somewhat expansive understanding of causation.

Typically, efficacy has been tied to the kinds of properties, powers or agencies that Aristotle, in the *Physics*, modelled on the notion of the efficient cause, and what Falkenstein (1998) has elsewhere called the ‘containment’ model of causation.¹⁰ What I aim to show, however, is that a case can be made in favour of empty space (and

⁹ See Kukso (2006, p. 22).

¹⁰ On this understanding causation is, as Falkenstein puts it, “analogous to giving birth” – causes must be capable of producing their effects; they must “contain at least as much” as is to be found in their effects (1998, p. 333). Such a conception is exploited by Descartes in his ontological and cosmological proofs for the existence of God.

space in general) having ‘*structural biff*’, here extrapolating from the toy term ‘biff’ introduced by Lewis (2004): ‘biff’ is intended to characterize whatever efficient quantities or properties confer causal ‘oomph’ or power on a material substance. What I propose, however, is that rather than treating immaterial empty space as inefficacious on the efficient model of causation, we can think of it as efficacious on the *formal* model – the cases of causation that Aristotle speaks of when he explains what ‘causes’ an octave, namely the arrangement of notes. Here then, as elsewhere, I am indebted to the work of Graham Nerlich, and particularly *The Shape of Space*, mostly overlooked in the philosophy of perception. Part of the contribution of this thesis is to remedy this a little.

So much, then, for the first premise in the argument sketched above - there is, I claim, a sense in which empty space can be argued to be efficacious. But do we perceive it? This is my question in the third chapter, ‘Clearing the Ground’.

Contra reductive treatments of seeing empty space – those on which empty space is reduced to perceiving the surfaces of objects that ostensibly ‘line’ those regions - I argue that empty space has visible properties that are directly perceived. Here I mean the space that, if we were to sketch the room we are now in, we might ‘represent’ by leaving parts of the sheet blank. Alluding to the Gestalt notion of a ground, I call this empty space in a *ground* sense, and I argue that, so understood, empty space looks ‘clear’ and ‘see-through’, an appearance that flows from its Euclidean shape. I try to domesticate these peculiar looks claims by explaining, after recent work by M. G. F. Martin (2010), that the visible properties of individuals are those that warrant comparative looks statements in the form ‘*x* looks *F*’.

In the fourth chapter, ‘Gaps, Traps and Paths’, I begin unravelling some consequences that flow from this ‘direct’ account of perceiving empty space – direct in the sense that it appeals, not to features of experience, but to the nature of space itself. I explain in what sense any given perception of a particular empty region depends on that region, so undermining the consensus that empty space must elude a causal theory of perception. Nonetheless, I grant that the way in which empty space enters into such cases of causal explanation is unusual.

In *The Images of Time*, Robin LePoidevin introduces the notion of *chronometric* explanatory involvement. He suggests that certain temporal notions – viz. when an event occurred or how long it took – contribute to explanations in a way that is non-causal, but which remain part of the full explanation of the relevant event. For example, when we ask why a firework exploded at a particular time, temporal notions, indeed *particular times*, enter into the context of the causal explanation – namely because it was lit five seconds earlier. I explore the prospects for a similar notion in the case of the perception of empty space, and I explain why the possibility of such *locometric* involvement means we can resist the temptation to invoke negative causation as a way of saving the causal theory in the face of apparently recalcitrant empty space. But this is not all. Since the look of empty space flows from its shape, it is not just the *absence* of objects at certain regions that explains the appearance of those regions. I take up this theme in Chapter Five, ‘Looking for Nothing’. I suggest that perceiving empty space is not best cast as a species of absence perception.

In *Being and Nothingness*, Sartre tells a well-known story. When he goes to the café to meet Pierre, he perceives Pierre’s absence. Notoriously, this leads Sartre to suggest that Pierre’s absence depends on a frustrated expectation that he would be seen, a characterization Richard Gale describes as ‘attitudinal’ (1976, pp. 55-61). I consider a recent attempt to resist this attitudinal take on the perception of absence – the Structural View, recently defended by Richardson (2010) and Soteriou (2011) – and I explain where the direct account so far detailed and the structuralist position diverge.

On the Structural View, seeing empty space involves a structural feature of experience – namely the phenomenology that one’s visual field is bounded. As such, unlike the direct account, it appeals not to the structure of space, but to the structure of experience. Insofar as it emphasizes the form of experience, then, it has an explicitly Kantian flavour. I explain in what sense this emphasis flows from a conception of the perception of empty space as a species of absence perception, for on this assumption there simply is no content to appeal to, hence the requirement to engage structural or formal features as explanatory. I show, however, in what sense both accounts can be brought into synchrony.

In the chapter that follows, 'Touching Empty Space', I pursue the thought that perceiving empty space is not simply the perception of absence or of no thing, this time considering our tactual awareness of empty space. Of course, the idea that we have tactual awareness of empty space requires motivation, and I do so by calling again on the work of Graham Nerlich. Nerlich argues that non-Euclidean space would be palpable so long as its curvature were sufficiently constant to allow mobility. He denies, however, that Euclidean space can be felt. To feel empty space we must *notice* it. I draw on M. G. F. Martin's template model of touch as a way of undoing this bind. Just as the look of empty space is apt to go *overlooked*, namely because empty space is colourless, nor do we notice our tactual awareness of empty space. When we 'touch' empty space, there is no sensation of contact. Still, as I argue, empty space is felt.

In Chapter Seven, 'Specular Space', I use this conclusion to set out a distinction between seeing *and* touching empty space, and seeing and feeling empty space alone. For example, when I see Rue de Rivoli in Paris on a live web-cam, though I can see see-through regions not yet occupied, I am not in a position to move through and so feel those empty regions (viewing them as I do in Glasgow). I suggest that we can use this distinction as a way of making sense of the perception of empty space 'in' specular objects – objects the surfaces of which reflect light. My strategy is to compare specular perception with the perception of empty space in perceptual objects, and in particular figurative paintings. Perhaps appropriately, this chapter is speculative. Even so, I think it illustrates how the conceptual resources I assemble in this thesis can be brought to bear on wider issues in the philosophy of perception.

Finally, in Chapter Eight, 'Taking Up Space', I consider a time-honoured philosophical 'puzzle' as a way of trying to elucidate the relation between seeing objects and seeing empty space. Since we only appear to see the facing sides of objects, it might be wondered how we can see them, in Strawson's idiom (1961, p. 54), as 'space-takers'. I argue, however, that when we see the facing side of objects, this is not *all* we see. We see the empty space 'outside' the object and that extends beyond and in front of it. What's more, we see the region that it occupies or takes up as *continuous* with these regions. As such, I suggest there is a complicity between seeing objects as space-takers and seeing empty space as space that objects could take

up. Both are *co-seen*. But this helps clarify, finally, in what sense the direct account I have tried to delineate and defend has the resources to make a space, in the philosophical literature on spatial experience, for a subject whose experience of the world has been so far under-theorised - one that can perceive empty space but without yet being able to conceive of it as absolute.

Unoccupied Places

cartographers would often embellish such empty spaces
with drawings of exotic beasts

- W. G. Sebald, *The Rings of Saturn*

When faced with empty space our intuitions seem to stall. On the one hand, we seem inclined to accept that empty space is something – something we can gesture at or attend to. But on the other, we tend to refer to it as nothing, as absence. As I noted too, phenomenology is no better guide. Though we may happily grant that we can keep our eye, not just on the doughnut but on the hole,¹¹ by the same token we are apt to deny that we see anything that doesn't have any observable colour or shape, an assumption I discuss in Chapter Three. So how are we to make a start?

My strategy is to start with metaphysics, and not just with metaphysics, but with a metaphysical assumption. In this chapter, I aim to motivate reasons for adopting metaphysical absolutism as an assumption of this thesis. But given that there is little consensus on the metaphysical nature of space, it might be wondered why this strategy is preferred. I suggest two related reasons.

First, there is a kind of conceptual freedom that comes with unbinding the imagination from perception that reflection on metaphysics prompts – this is something the work of Graham Nerlich teaches.

Second, since such reflection can yield perspectives on experience that our naïve suppositions might otherwise be inclined to dismiss, as I hope is borne out by this thesis, we risk leaving certain argumentative paths unexplored when we neglect the murkier noumenal world – i.e. those that flow from metaphysics to phenomenology.

¹¹ As C. B. Martin writes: “Lewis wishes to keep his eye upon the doughnut and not upon the hole, but absences are perceived” (1996, p. 64).

But, as such, the investigations that take up the early part of the thesis should be read as mostly methodological. I try to use metaphysics as a way of clarifying phenomenology. But to this extent the metaphysics that sparks the clarification need not itself be embraced, or at least not necessarily; one can, I think, grant some of the conclusions I draw while remaining agnostic on the metaphysics that prompts the reflection (though I leave the reader to decide which). Rather, a bit like Wittgenstein's ladder, once we have surfaced with the phenomena, the metaphysics can be more or less left behind.

So here is the first rung. In this chapter, I consider the dispute between the metaphysical absolutist and the relationist over the existence of unoccupied places. The relationist is a skeptic, but I suggest that difficulties internal to relationism should make the realist feel unthreatened.

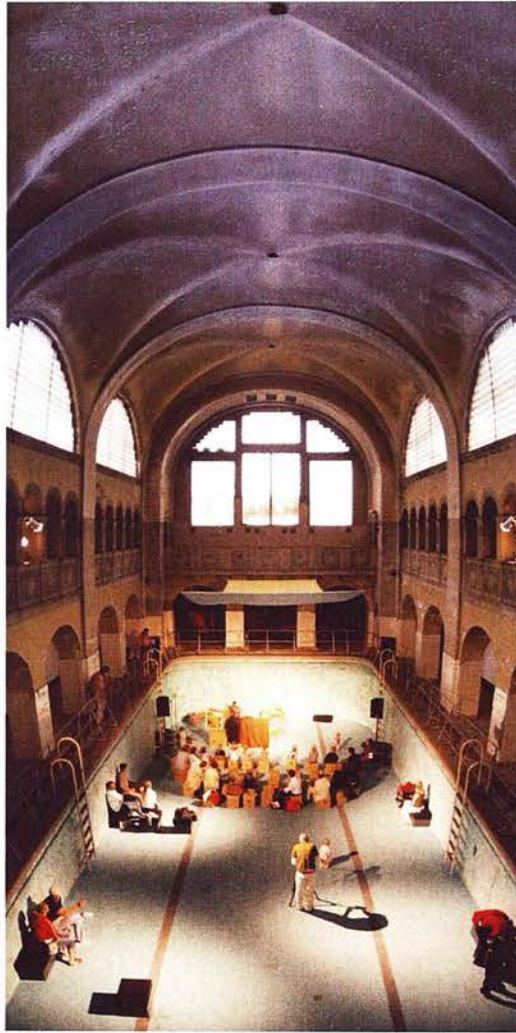
The chapter unfolds as follows. I begin by saying something about what we tend to mean by 'empty space' (§1). In §2-3, I offer a sketch, albeit a fairly impressionistic one, of the doctrines of absolutism and relationism and I say something about our naïve category 'space' (§4). I then try to make sense of the relationist's reductive identification of empty space with possibilities of location, and I consider one such attempted reduction – that offered by Graham Forbes (1987) (§5). I close, in §6, by outlining those features of relationism that make the absolutist's invitation to realism compelling enough to take up.

1.

For the most part, when we talk about regions being empty, we have some reason for doing so and, hence, do so with the aim of being, in Gricean idiom, informative and relevant.¹² But this being the case, it is mostly a *relative* sense of being empty that we tend to use. That is to say, when we talk about empty regions, we typically talk of

¹² In 'Logic and Conversation', Paul Grice proposes that conversations that are co-operative display certain pragmatic features; speakers tend to be truthful, to supply only as much or as little information as is required, and to be relevant and clear. On the assumption that most of our conversation is co-operative, there is, we might suppose, little need to talk about empty space (unless of course if doing philosophy). See Grice (1989, Chapter 2).

regions that are empty of *some specific thing* or type of thing or stuff. For example, one might gesture at an “empty” chair by the fire; it is “empty” because no-one is sitting there. Indeed, it may be empty of a particular person - it may be Penelope’s chair. Likewise, a purse may be empty of coins, a dancefloor of dancers. Coins and dancers are things, but a region or place can be empty too of substances - for example, air or, like the pool below, water. This brings into view the *comparative* use.



Stadtbad, Oderberger Strasse, Berlin. Picture:
Christian Thiele. [wikimedia commons](https://commons.wikimedia.org/wiki/File:Stadtbad_Oderberger_Stra%C3%9Fe.jpg).¹³

An “empty” pool may be relatively empty, either of swimmers or of water, and typically we rely on context to decipher which state of affairs we mean to track. Even so, someone in a philosophical mood might yet deny that the pool above is “empty”; while it is relatively empty, it is comparatively full.

¹³ See www.wikimedia.org.
<http://commons.wikimedia.org/wiki/Stadtbad_Oderberger_Stra%C3%9Fe>. Retrieved 24/08/11.

Now, in both relative and comparative uses what are picked out as “empty” (or otherwise) are *particular* places – the place where Penelope fails to be (her chair), the public bath at Oderberger Strasse (above). There is, however, a more *general* way of understanding the phrase “empty space”, one that, philosophy aside, we don’t tend to use simply because there is no need; there is nothing informative or relevant we can say about the regions it picks out. As I aim to show below, such “empty” regions are those that have a characteristic phenomenal appearance; as I will argue in Chapter Three, they have a ‘look’. Here I gesture at what I have in mind.

Imagine a pencil sketch of the layout of the room you are now in, and suppose that no region is in shadow. It is likely that the empty spaces between you and this manuscript, and you and the door (presuming it too is empty) are ‘represented’ in the same way – by blank paper, or, if you like, an absence of pencilmarks. These are the regions that this general way of understanding the phrase “empty space” aims at. It is worth noting in what sense this general use lacks relative or comparative force:

Though it is true that such regions are empty of a particular kind of stuff – namely *visible material* – unlike the chair by the fire, they are not empty of any particular visible thing or person (hence the notion that the use is *general*). But, conversely and relatedly, just as they are empty of nothing in particular, so can they be filled with anything at all – chairs, bicycles, or even transparent, invisible objects (a large pane of glass or a tiny cloud of dust). But this being so, in designating such regions as “empty”, we typically don’t aim to imply that they are “empty” either in a relative or a comparative sense, and this is because, unlike the public baths, we don’t tend to think that such “empty” regions *can be emptied* and so be *made emptier*, at least not until we learn that they are filled with air and dust. That is to say, unlike places or things that we are apt to say are “filled” – seats that are occupied or biscuit tins – there is no intervention we can typically perform to empty what, in this sense, we aim to mean by “empty space”. Call this empty space in a *ground* sense.¹⁴

¹⁴ The term ‘ground’ naturally alludes to the technical Gestalt notion, but, as I aim to use it, is not to be identified with that notion. On the Gestalt notion, what counts as a ground can be spelt out in terms of certain image properties – so, a figure is typically more convex, smaller and brighter than the ground, its texture and border sharp and tight (see Casati and Varzi 1994, p. 159). But ‘empty space’ in a ground sense is only meant to pick out regions that, as I will later argue, have a certain kind of phenomenal appearance. On my understanding then, while an expanse of seawater can act as a



Sketch by Emily Brontë showing herself and Ann at work in the Parsonage. The unmarked paper between the table-legs (for example) ‘represents’ empty space in a ground sense. [wikimedia commons](https://commons.wikimedia.org/wiki/File:Emily_Bronte_Parsonage.jpg); ¹⁵

In the next section, I spell out a fourth and related way of reading “empty space”, the sense often used to designate *absolute* space.¹⁶

2.

Ontologically speaking, and historically conceived, there are two candidate ways in which the space we are in could be: absolute or relational. I spell these out in turn.

When a space is said to be ‘absolute’ it is typically adjudicated to have two central features.¹⁷ First, it is held to be independent of the objects it contains; a bit like a container, things are contained in it – call this the feature of *Independence*. Second, it

‘ground’ against which the figure of a seahorse, say, can ‘stand out’, that region does not have the look that ‘empty space’ in a ground sense typically has. This will become plain on reading Chapter Three.

¹⁵ See [www.wikimedia commons.org](http://commons.wikimedia.org/wiki/File:Emily_Bronte_Parsonage.jpg).

<<http://commons.wikimedia.org/w/index.php?title=Special%3ASearch&search=emily+bronte>>. Retrieved 24/08/11.

¹⁶ I am grateful to Jessica Leech for discussion on how to sort the foregoing distinctions.

¹⁷ Though see Earman (1970) for a more critical analysis of the ways in which the term ‘absolute’ can be applied in opposition to the term ‘relational’.

is understood to have a so-called ‘manifold structure’; that is, it is composed of points that are arranged in a particular order - call this the feature of *Structure*. We can capture the import of this latter feature by appeal to an example Newton offers in his *De Graviatione*, a work not published until 1962:

“the immobility of space will be best exemplified by duration. For just as the parts of duration are individuated by their order, so that (for example) if yesterday could change places with today and become the later of the two, it would lose its individuality and would no longer be yesterday, but today; so the parts of space are individuated by their positions (*positiones*), so that if any two could change their positions, they would change their individuality at the same time and each would be converted numerically (*numeric*) into the other. The parts of duration and space are understood to be the same as they really are only because of their mutual order and position (*ordinem et positiones inter se partes*); nor do they have any principle of individuation apart from that order and position, which consequently cannot be altered”. (quoted in Slowik, unpublished, 2008, p. 25)

Here, Newton elucidates the nature of the manifold structure of space by analogy. Just as yesterday cannot be yesterday if it were to change places with today, nor can a point in the manifold change places with any other and yet be that point. Of course, the very thought that a point could leap over another is only hypothetical. As Newton points out, space is immobile and indiscernible – it can’t be divided by being torn or cut.¹⁸ But, as such, points in the manifold are individuals, despite being otherwise indistinguishable. Put somewhat differently, we might say that, by having a particular place in the manifold, points *have* particularity without *being* particulars, that is, they have particularity *without being entities*.¹⁹

Now, notice that putting things this way involves devolving the notion of being an individual from the notion of being a particular. In *Individuals*, Strawson had argued that particulars are individuals that occupy places. But, on such a view, since places are what ground the individuality of particulars, and since particulars occupy places,

¹⁸ See Slowik (2008, p. 7).

¹⁹ As space can contain particulars, and universals cannot contain particulars, space must itself be a particular though of a peculiar sort; one that is not individuated by being somewhere (see Johansson 2004, p. 147).

places are naturally neither individuals or particulars. Yet we need not insist on this identity. As Denkel writes:

“Particularity does not entail being an entity. In this sense ‘being a particular’ acquires meaning in contrast with ‘being a universal’. In Aristotle’s characterization, the latter signifies something’s being the case multiply and repetitively, as for example, when something is said to exist or to apply multiply and repetitively. Thus being a universal entails being identical with oneself as a plurality. The opposite of this, i.e., ‘being a particular’ is for something to be the case uniquely and without repetition. For it to have this qualification is for it to be identical with itself as a single case only, i.e. for it to be just one in its entirety.” (1996, pp. 66-67)

But so understood, regions of absolute space can have particularity and so be individuals without being particulars in Strawson’s entity sense; they have their individuality, and hence particularity, in virtue of their position in the manifold.

In the case of *Independence* too there is a further refinement we can make. Some absolutists take the feature of *Independence* to mean that space exists *prior* to objects. But we can understand priority in two distinct ways. This requires distinguishing ‘substantivalism’ and ‘absolutism’.

Substantivalism is the view that space is a distinct substance from whatever substance it is that comprises objects, while Absolutism may be considered an enhanced version of substantivalism – call it Absolute Substantivalism or, hereafter, Absolutism. This is distinguished from Substantivalism by the claim that, in addition to being substantival, space has absolute properties – orientation and dimensionality, as well as certain topological and geometric features. These are designated ‘absolute’ since they are understood to be properties of the space *as a whole*.

Now, since objects also have such properties – orientation, dimensionality etc. - we might wonder what the relation of *these* properties is, where these are properties of *objects*, to the properties of space. Broadly speaking, three possibilities are canvassed in the literature:

Objects may *inherit* their spatial properties from an absolute space, they may have spatial properties *in addition to* and independently of an absolute space, or they may *project* spatial properties onto a substantival space that in itself lacks absolute properties.²⁰

I don't intend to sort among these positions. Insofar as they suggest a two-part recasting of the priority issue, however, they are nonetheless noteworthy. This is because we may ask *both* whether what is prior is substantival or absolute, and whether objects have their spatial properties dependently or independently of space, (and, conversely, whether space has certain structural features independently of objects).²¹ For the purposes of this thesis, I leave these matters aside. Rather, I assume that Absolutism is the relationist's target.²²

Together these twin features, those of *Independence* and *Structure*, allow us to formulate the primitive notions of spatial distance and relatedness as the absolutist understands them. For the absolutist, distance is understood in terms of the set of intervening manifold points between two objects, while spatial relatedness is conceived in terms of *a path* connecting the relevant relata. In being comprised of manifold points a path is thereby understood to be *made of space*.

Compare this to the picture painted by the relationist.

Unlike the absolutist, the relationist denies *Independence*, urging instead that space depends entirely on objects and the spatial relations between them. For the relationist, objects and spatial relations *constitute* space. A common way of making sense of this claim is by asking what the candidate truth-makers for claims about space are.

For the absolutist, statements about space are made true by absolute space and so are made true *independently of objects*, but for the relationist the only truth-makers that

²⁰ See Dainton (2001, pp. 139-140) and Earman (1970).

²¹ These issues are distinct. A theorist who takes substantial space to be prior to objects in the first sense may not yet grant that the structural features of space are also independent of, and thereby prior to, objects in the second sense.

²² Note that since absolute space may have existed prior to and independently of objects, it might never have been "empty" in a relative sense – that is, it might never have been empty of material.

can be appealed to are objects and spatial relations.²³ The ‘vanishing test’ helps illustrate this thought.

On relationism, if all the objects we describe as being ‘in’ space were to vanish, so too would space. But if all the objects in absolute space were to vanish, we would still be left with the manifold points ‘at’ which they were formerly located. On Relationism, then, having a certain position in manifold space can no longer be what individuates objects – a different criterion must be sought. But likewise, since spatial relations can’t be conceived as paths *through points*, distance is no longer extrinsic – that is, it can’t be characterised and determined *in relation to the manifold*. I spell this thought out.

Drawing on Bricker (1993), Dainton (2001, pp. 145-146) distinguishes Gaussian (after Carl Friedrich Gauss) and intrinsic distance. The Gaussian distance between two points is given by the shortest *continuous path* between them. By ‘path’ understand something that can be physically traversed, while two points are ‘path-connected’ if there is a path through space that connects them. An example helps explain how intrinsic distance differs.

Consider two villages p and q separated by a high mountain. The Gaussian distance between p and q is given by the shortest connecting path between them, say around the foot of the mountain. In contrast, the intrinsic distance is given by *the length of a straight line connecting them* – the length that a tunnel through the mountain would be perhaps. But importantly a line is just a *geometric* notion; the straight line connecting p and q may, *in absolutist terms*, denote no possible path.

For example, imagine that a region of *void* separates the two villages. Unlike vacuum, void is an absence of space.²⁴ As David Lewis writes:

²³ This constitutive thesis does not entail anti-realism in the sense of Dummett (1982). The relationist is a realist about space.

²⁴ It is open to the absolutist to treat regions of void as holes in spacetime. For the relationist however, since void and vacua are merely hypothetical regions where no objects actually are, they are effectively assimilated.

“if there is a vacuum within these four walls, there may be quite a lot of objects between the walls that are capable of exerting forces and supplying energy. Whereas if there is a void between these walls, then (even though the walls are some distance apart) there is nothing at all between the walls. What? – Not even any spacetime? Not even any flat, causally inert spacetime? – No, not even any spacetime. Nothing at all” (2004, pp. 277-278).

But if void is an *absence* of spacetime, then naturally no continuous path *through space* can transverse it. How could it? *There is no space*. Hence, *in an absolutist sense*, were p and q so separated, they would not be spatially related. Since, however, the relationist rejects the manifold, hypothetical regions of void are no obstacle at all. Peculiarly, spatial relations can act through them.²⁵

So how should we understand the relationist’s relations?

3.

Spatial relations are of two distinct genera. We can sort among object-space relations and object-object relations. Since the relationist rejects the existence of the former, only the latter are disputed, and specifically their nature. For the absolutist, recall, spatial relations are made of space – a bit like a beaded necklace, they are made up of manifold points. But since for the relationist, spatial relations partly constitute space, they can’t be made of the space they constitute. So what are they? One way of finding out is by analogy with other familiar species of relation.

Take, for example, the supervenience relation. A well-known way of spelling this out is in terms of an original creationary act. On this characterization, if A-properties supervene on B-properties then when God created B-properties *he had no further work to do* - the supervenient A-properties come ‘for free’.²⁶ The question is whether spatial relations come for free in this sense.

²⁵ It is worth noting that both these notions of distance are part of our conceptual repertoire. A cyclist may conceive of the distances separating the villages in both intrinsic and Gaussian terms - she may be frustrated that somewhere so near could be so far away.

²⁶ See Chalmers (1996, p. 33).

Now, to answer this much it seems we are required to establish the *function* of spatial relations, and here, as elsewhere, Dainton (2001) can guide us.

Dainton places two constraints on any metaphysical theory of space: to explain both the intuition that all the places in space are connected as well as the observation that there are constraints on movement in space - we cannot move about in all directions. On relationism, spatial relations seem to guarantee both; they both connect *and* constrain the movement of objects. But this suggests that when God created the realm of objects, he *did*, after all, have further work to do – he had to weave them together, to connect them. Hence, as Dainton writes, “it seems clear that spatial relatedness is not an ontological free lunch.....but [requires] an additional creative act on God’s part” (ibid., pp. 142-143).

Yet since spatial relations come at a cost, another candidate relation also seems disqualified – the groundedness relation. After Nerlich and Dainton we can harness the following diagnostic as a way of trying to work this out: Since the causal relation is arguably a grounded relation, if spatial relations are grounded, then we should find that the two species of relation are in some way alike.

Consider the vanishing test as a way of excavating a parallel.

If a particular cause, *C*, of a particular effect, *E*, were to vanish, so too would the effect.²⁷ For example, if the cause of apple trees bearing fruit is pollination by honeybees, and honeybees were to become extinct, apple trees would no longer bear fruit.

But consider the same test when applied, not to causally related properties, but to *spatially* related objects – a token apple tree and a bee in the same garden. Suppose the bee falls prey to a bird. Since the tree and the bee are only spatially related and not related of some mysterious grounded relation, the demise of one isn’t the cause of the demise of the other; the tree doesn’t disappear.

²⁷ I overlook the possibility that the effect might have been brought about some other way – see Chapter Two.

Nerlich (1994, pp. 18-19) calls such mysterious relations *internal*. A relation is internal if in every world in which A exists, B exists also. Conversely, a relation is *external*, if there are worlds in which A exists but B does not exist. Spatial relations are naturally external. But this, in turn, suggests a problem.

Since the causal relation is internal and spatial relations are external, it might be wondered whether spatial relations, in being external, are also causally inert. Well, puzzlingly, it seems the answer is ‘no’. As Dainton puts it, spatial relations are ‘*potent*’ – after all they connect and constrain (ibid., p. 143). But on the assumption that naturalistic explanation is causal this then leaves the relationist with a difficult geminate character to reconcile; spatial relations have causal significance despite being external. I return to this difficulty in the closing section of this chapter.

So how far have we come? We have established that the relationist’s spatial relations are non-supervenient, hypothetically ungrounded and external. I suggest that ‘objects’ may simply be identified as the *relata* of such relations.²⁸ In the next section, I say a little about our naïve category ‘space’, before turning to the key expository task of this chapter – the relationist’s reductive treatment of ‘empty space’.

4.

When we think about our naïve ontological category ‘space’, the following seems apposite:

We appreciate that things can move about ‘in’ space, but we don’t think that space can move; there is no intervention we could perform so as to make some part of space move. This explains why we can’t measure empty space without some object, a meter stick say – we can’t move parts of space so as to line them up with each other.

²⁸ Notably this leads to a distinction between simple and complex objects: Simple objects are the *relata* of external relations but do not enter into any grounded relations with other simples. Complex objects, in contrast, might be thought of fusions, the parts of which enter into both spatial *and* grounded relations.

Likewise, because things can move about in space, aggregates of things can be formed where the parts are primary and the whole secondary – for example, a bundle of clothes or basket of fruit. We understand, however, that this is not the case with space. Since parts of space can't be moved we can't make aggregates of space. Rather, just as a slice of cake is a sub-volume of the larger cake, the parts of space exist only as sub-volumes of the larger space in which they are. Hence, unlike aggregates of things, the larger space is primary and the subvolumes are secondary (see Johansson 2004, pp. 146-147).

But this being so, *Independence* and *Structure* seem to hold of the space we are in, and what's more, this is how we *understand* 'space' to be. As such, I take it that our naïve ontological category 'space' is absolute. Indeed, I take this as a datum.²⁹

Now, earlier I noted that the phrase 'empty space' is sometimes used to pick out absolute space; this was the fourth sense I isolated. Since, however, the relationist denies the existence of absolute space, she thereby denies the existence of empty space in this particular sense - that is, she denies the existence of unoccupied manifold positions or places. We are now in a position to explain how this sense interacts with the third sense detailed above, the ground sense.

As I have indicated, there is some observational basis for absolutism – we observe that parts of the space we are in don't move, and that things appear to move about in space. What's more, *there appear to be unoccupied places*; regions that we refer to as "empty space" in the ground sense. But this suggests that relationism can be cast as a species of phenomenalism. As Mundy (1983) points out:

"The phenomenalist picks out some class of facts which may be

²⁹ It is worth noting that both Peacocke (1979) and Evans (1985a) claim that our prescientific conception of space is relational. See Peacocke pp. 41-52, and Evans p. 254. (Writing of Strawson's use of a Master Sound in his construction of a Sound World in Chapter Two of *Individuals*, Evans comments: "The space of Strawson's auditory universe is an absolute space and not a framework constituted by the spatial relations of its occupants"). I don't aim to argue against these theorists. It seems to me that what Peacocke and Evans in fact mean to discuss is not our naïve ontological category 'space' but rather what is required for *knowledge of location*, namely a conception of the relations in which objects stand to each other independently of one's experience of them at a place. For a robust defense of the claim that our naïve ontological category 'space' is a container space, see Johansson (2004).

regarded as the observational basis for the realist doctrine, and proposes to construct a modified theory governing those same facts, without appeal to the realist hypothesis. The phenomenalist theory is thus supposed to be observationally equivalent to the realist theory under attack. In our case, the special class of facts regarded as constituting the observational basis are those involving spatial relations among physical objects. A successful relationist theory is thus expected to produce the same predictions regarding those facts as the absolutist theory, on the basis of its postulated laws governing the spatial relations in question. It is not, of course, required to reproduce any of the assertions of the realist theory which go beyond that observational basis". (p. 207)

Now, since the relationist theory might be thought of as a phenomenalist theory, the class of facts which count as the observational basis for realism *are granted*. But this being so both theorists might be thought to allow that we 'observe' empty space in the third sense detailed, the sense that picks out the ground – the unoccupied places that in our hypothetical sketch would be represented by blank paper. What the relationist insists however, and what the absolutist denies, is that the class of facts that *constitute the observational basis for realism* need not appeal to empty space in the *fourth* sense – that is, to absolute space. But as such, what grounds the truth of statements about empty space or unoccupied places in the *third* sense is distinct on both accounts.

For the absolutist, the possibility of an object taking up a position is grounded in absolute space. But for the relationist, as I will explain, the possibility of an object taking up a position is grounded in the possibility of certain spatial relations holding between objects. In terms of our metaphor, we can spell this out as follows.

Typically, we think that we can mark a blank region of paper because there is some *paper* to mark. Likewise, we think we can fill a certain empty region because there is an unoccupied place, some empty space, to fill. This is our intuitive understanding. For the relationist however, the possibility of filling an unoccupied place is understood to be grounded instead in *the bare possibility of an object being located there*. So, translated to the case of the sketch, the relationist supposes that the possibility of marking a blank expanse is grounded in the possibility of a mark being made in that region. But this just shores up how strained the metaphor is when applied to relationism. No-one would wish to deny that the paper is what grounds the possibility

of marking it, which is why the relationist would reject the metaphor. For the relationist, there *are* no unfilled manifold points that exist independently of objects being ‘located’ there. Hence, there is no ‘blank’ equivalent. I spell out the relationist’s alternative understanding below. First, a clarification.

In this thesis I am mostly interested in empty space in the third sense detailed – the interspaces that, were we to sketch your room, would be left blank (for example, the blank spaces ‘representing’ the empty space between the legs of Emily Brontë’s writing table). Consider, however, the particular region of space that you are currently perceptually aware of, the region that falls within the bounds of your visual field. This region, *which contains both full and empty regions*, is experienced as a sub-volume of a larger space that has that region as a part.³⁰ But in experiencing it *as* a subvolume, we thereby conceive of *the space of which it is a part* as absolute, at least in the following sense: we understand both that the parts of space cannot move (*Structure*) and, since things can be moved about in space, that space itself is not dependent on objects located in it (*Independence*). Conceiving of space as absolute in this sense, then, involves conceiving of it as “empty space” in the *fourth* sense, the sense that both our naïve experience and our conception of the category ‘space’ make compelling.

5.

As noted, the relationist makes sense of ‘empty space’ in terms of possibility. Since this is a difficult notion to make vivid, I draw on an analogy that Johansson (2004, pp. 150-151) develops for the same purpose.³¹

Colours can be ordered along three dimensions – hue, saturation and intensity - which in turn form a colour space; a space which, as Johansson notes, is well known to the paint-dealer. In such a space, the ‘position’ of a colour is given as a function of its

³⁰ This phenomenology is explained in more detail in Chapter Five, specifically by appeal to the Structural View.

³¹ It should be noted that much of the discussion in this chapter is indebted to a reading of Chapter 10 - ‘Container Space and Relational Space’ - of Johansson’s *Ontological Investigations*. I am grateful to Kevin Mulligan for the reference.

distance from other colours that are distinguished from it along one or more of these dimensions. Consider now all the actual things that exist, and assume they have specific colours. We can plot the ‘location’ of these colours on the colour space as a function of their hue, saturation and intensity. But suppose now there are ‘gaps’ in this space – positions that no *actual existent things* occupy, or colours that no actually existent things have – and imagine *non-actual, possible things* occupying these gaps. This is what makes a colour space a relational space: While there may be ‘gaps’ in the space which indicate that no actual thing has the colour that makes up that part of the space, the ‘gap’ itself is not empty – it specifies a colour of a specific hue, saturation and intensity *but which isn’t actually instantiated*. It is hence a colour that something could possibly have but doesn’t. How does this analogy apply to space?

For the relationist, what holds for colour in the colour space is true of locations for objects. Just as the ‘gaps’ in the colour space point to the colour of non-actual objects, the apparent gaps in space itself point to ‘locations’ that possible objects could have but don’t.³² How might such an account apply in practice? In the case of colour, uninstantiated colours are reductively identified with colours that *do* exist. But what apparatus could make sense of the notion of a possible location? Below, I outline a proposal made by Graeme Forbes (1987).

Forbes’ inspiration comes from mathematics:

“The slogan that places are possibilities of location adverts to the idea that just as a rational is introduced by a pair of naturals, so places are introduced by co-ordinates from a frame of reference, co-ordinates which, relative to that frame, are possibly the co-ordinates of some object” (p. 299).

Here, Forbes’ idea is that just as we can ‘introduce’ the number 3 as equal to the fraction $6/2$, a place can be introduced by appeal to objects and times, given a particular frame of reference. The use of the term ‘introduce’ is noteworthy. A place is not understood to *be* a set of objects and a frame of reference, but is rather *characterised in terms of these*. As such, Forbes calls himself a reductive realist. He is

³² There is, however, a difference. The relations that make up a colour space are grounded – they are grounded in colours. But spatial relations are external and so are hypothetically ungrounded.

a realist about places but he reduces them to ostensibly less problematic entities – objects and spatial relations.³³ On this assumption a definition is offered:

Def: A frame of reference, **F**, is a pair consisting of a time and a sequence of objects which are “sufficiently distributed” – where **F** can be written as [$\langle a_i \rangle, t^*$]

Here $\langle a_i \rangle$ refers to a set of “sufficiently distributed” objects - objects that are “sufficiently distributed” do not occupy the same place - while a frame of reference (**F**) is given by the set of these objects at a time. How do we make sense of *co-ordinates* from the frame?

Co-ordinates are understood to form *a sequence of numbers*, $\langle d_i \rangle$ - $\langle d_i \rangle$ picks out a place which is d_1 units from the location of a_1 at t^* , d_2 units from the location of a_2 at t^* , d_3 units from the location of a_3 at t^* , and so on. Given a two-dimensional space, and some unit of measurement, this yields a formulation of what it is to be a ‘place’:

Def: [$\langle i, j, k \rangle, \mathbf{F}$] introduces a place iff $\Diamond (\exists t)(\exists x)(D(x, a, t) = i \ \& \ D(x, b, t) = j \ \& \ D(x, c, t) = k)$, where “ $D(x, y, t)$ ” is the distance between x and y at t .

Or in everyday English: Relative to some frame of reference, **F**, a set of objects a, b, c , and a target object x , if the distance between x and a at t is i , the distance between x and b at t is j , and the distance between x and c at t is k , then x is at a place introduced by the numbers (i, j, k) .

³³ This, he assures us, is not a form of eliminativism.

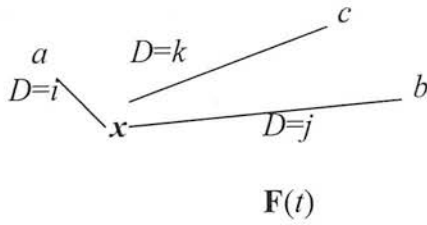


Figure 1: x is a place, relative to \mathbf{F} at t , given by the numbers (i, j, k) .

Yet with this in hand, Forbes recognizes a difficulty, which in turn clarifies the import of the term ‘introduce’:

Numerous different “entities” of the form $[< i, j, k >, \mathbf{F}]$ but involving *different* \mathbf{F} s will correspond to one and the same place. This is another way of casting a familiar insight: We can individuate the same place in terms of different frames of reference. I can individuate my present location relative to the door behind me, a favourite tree, the moon. But if a place is *merely* a set of numbers, then it becomes difficult to sort among these distinct ways of picking out the same place. Forbes grants this much for he acknowledges that $[< i, j, k >, \mathbf{F}]$ must be a *temporally and modally* rigid designator of a place, a concession I return to in the next section. In the meantime, however, consider the challenge he faces: In order to reductively reify unoccupied places, he needs to show how this characterization of place can extend to places that are *not actually occupied*. Here, his strategy is as follows:

Like places that are only possibly occupied, places that are occupied at times *after* t – viz. that are not occupied *now* – are not actually occupied. So if we can make sense of place occupation at times *other than* t , then we can make sense of possible occupation.

Now, critically this idea trades on an identification of the actuality *that is opposed to possibility*, with the actuality *that is opposed to times that are not now present* or actual. Forbes’ idea is to try and make sense of occupation at times after t as a way of making sense of possible occupation. To begin, however, an initial worry must be defused, namely, how a frame of reference that was set up at one time can extend to a later time. But not only this. Since a frame is characterized in terms of the location of objects, and since *objects can change position*, it might be asked: How can the same

frame apply to objects that have changed position?

Peacocke (1979) offers one solution. He suggests that if there is a change in the relations of objects at a time after which a frame of reference was established, then the configuration that is consistent with how things were at t , but which would have resulted from the *least motion of the objects in terms of which the frame was originally set up*, can be attributed the same frame of reference (see *ibid.*, pp. 50-51). This principle is supposed to explain how the same frame of reference can apply to objects that have changed position. Unfortunately, however, it is subject to a time-honoured objection – Newton’s rotating globes.

In a universe of two objects that are at a fixed distance from each other and are mutually rotating, no motion can be detected. But although no motion can be detected, the globes are not motionless. The principle of the minimization of motion therefore delivers the wrong answer. Forbes suggests an alternative solution.

Instead of applying a criterion of minimal motion, suppose that facts about the displacement of objects – relational changes – are explained by a theory of motion-producing forces. That is, suppose that when objects change position, they do so because of the operation of motion-producing forces. The *correct* application of a *theory* of such forces, says Forbes, should yield the configuration that is consistent with the application of a frame of reference that was set up in terms of the location of those objects at an earlier time.³⁴

This, then, completes the first step in his proposed reduction. To be clear, it is proposed that a frame of reference, F , that was set up at t^* , in relation to a set of sufficiently distributed objects $\langle a_i \rangle$, can apply at times *later than* t^* so long as it is granted that the set of distributed objects to which it applies at those later times is the set the current distribution of which would be predicted by the correct application of a theory of motion-producing forces. This, then, overcomes the difficulty of extending F to times other than t^* , as well as the worry that, since objects can move, F can’t apply at other times. This much established, the second step runs as follows:

³⁴ Though it appeals to motion – change of place – this solution is, Forbes insists, non-circular. I don’t contest this claim here since my goal is only expository.

Forbes supposes that the problem of extending an actual coordinate system into *merely possible circumstances* reduces to the problem of extending it *into the future* – this follows from his identification of the actuality that is opposed to possibility with the actuality that is opposed to times (including the past) that are not now or actual. In addition, however, it assumes a particular model of possible worlds, one on which a possible world is understood on a branching conception of time. On such a view, a possible world is one that ‘branches’ from the actual world at a time t .³⁵ But on this reductive assumption, and assuming too that **F** can be extended to future times (which, recall, is what the first step established), it only remains for him to specify *which class* of possible worlds **F** can range over. I spell out this thought below. First, I clarify what this part of his argument is supposed to accomplish.

Having established that **F** can apply to times later than t , Forbes supposes that the application of **F** to possible circumstances reduces to extending it to future times, a method for which is provided by step one. But this leaves only one further step to complete his proposed reduction.

In trying to delimit the *class of possible worlds* branching from the present (and in terms of which he will reductively identify unoccupied places – places that are occupied in those worlds but which are not actually occupied), Forbes has a number of criteria to guide him. Naturally, only those worlds in which the theory of motion-producing forces applies can be admitted (this followed from the first step in the proposed reduction). In addition, since there are some places that are ‘unoccupied’ as *a matter of physical necessity* – i.e. voids – the relevant set should also contain some logically, though not physically, possible worlds. Conversely, however, although some logically possible worlds are included, *some must be excluded*, specifically if they permit a range of motions distinct from those allowed in the actual world. This leads Forbes to introduce a key notion: that of *geometric accessibility*.

³⁵ Up to that time, possible and actual worlds are understood to be numerically identical. Belnap (1992) explains the history of the origins of the concept of branching time by recalling “the logicians Prior and Thomason and Mc Call”. He writes: “To express some fundamental features of our world associated with indeterminism as a foundation for modal tense logic, Prior, and after him Thomason, started out as the old physicists with *moments* [moments are instantaneous Euclidean spaces in a linear temporal order]. Then he generalized linear temporal order to a branching temporal order. The manifold of moments ordered in this tree-like way is called *branching time*” (p. 386).

Only possible worlds that are geometrically accessible from the actual world are included in the set of branching possible worlds. What is this notion supposed to capture?

The thought that some worlds are geometrically inaccessible from others is best explained by example. Take two L-shaped things – one with the ‘foot’ facing left and the other with the ‘foot’ facing right. In a two-dimensional space such figures cannot be made to coincide with each other. For example, ‘L’ would have to be ‘lifted off the page’ so as to coincide with its printed mirror image. Hence, worlds in which they *do* coincide are not geometrically accessible from two-dimensional worlds. For an absolutist, geometrically accessible worlds are elucidated in terms of the properties of absolute space – indeed, this is a compelling reason for realism, and I return to it in Chapter Two (see Nerlich 1979, 1994, 2009). But how does a *relationist* make sense of geometric accessibility?

Forbes draws a parallel with Humeanism about the laws of nature. For a Humean, causal laws supervene on what happens, so it couldn’t be the case that the same physical events could unfold in two worlds but the causal laws differ.³⁶ In contrast, a non-Humean could allow this much. In what, then, would the sameness of the events consist? Says Forbes: in the obtaining of a certain class of counterfactuals such that if the antecedent is true in both worlds, then so is the consequent.

Now, Humeanism doesn’t seem to hold for geometric laws since the same physical event could unfold in spaces of different geometries – for example one could “lift” the L off the page in any world of dimensions more than two. Hence, supervenience can be denied. Rather, what makes two worlds geometrically the same is that the same geometrically fundamental counterfactuals are true at both worlds. As such, what makes a possible world geometrically accessible from the actual world is not, as the absolutist has it, the geometric features of *absolute space* (a point which I discuss a little further in Chapter Two), but rather *the bare holding of such modal facts*, facts concerning possible movements. But this is all Forbes requires to make sense of unoccupied places – places that are merely possibly occupied now. Such places are all

³⁶ See Psillos (2002, Part II) for a detailed exposition of both Humean and non-Humean approaches to the laws of nature.

those that are in the set of geometrically accessible branching worlds; worlds at which the same counterfactuals obtain.³⁷

This completes my exposition of Forbes.³⁸

6.

So far I have outlined, in broad strokes, the doctrines of Absolutism and Relationism, and I have tried to provide a neutral exposition of one of the few explicit accounts in the literature that tries to provide a reductive identification of unoccupied places with possible locations – Forbes (1987). In this section, I sketch some difficulties for the relationist's skeptical challenge. Of course, I don't suppose that these difficulties can't be defused by the relationist, my point is only that, given these difficulties, Absolutism is compelling, and all the more so because it tallies with our prescientific understanding. As such, the iteration of these is intended to motivate my adoption of Absolutism.

1. *The Difficulty from Individuation*

In the course of the discussion above, I focus only on ontology. It might, however, be objected that I have overlooked what is most critical in the dispute between the absolutist and the relationist; the question as to whether motion is relational or absolute.³⁹ If there is absolute motion, then the absolutist is vindicated. But if motion is relative, perhaps it might be supposed that absolute space no longer has any explanatory function.

³⁷ This allows him to finally address a difficulty noted at the outset of this exposition – the fact that the same place can be picked out by recourse to countless frames. Though we can introduce places in terms of frames of reference, “F coordinates are not identical to places, any more than a single pair of integers is identical to the rational it introduces: we need equivalence classes of co-ordinates from different frames of reference” (1987, p. 308). His idea is to introduce *distinct* frames F and F', together with distinct configurations or distributions of objects <d> and <e>. [<d>, F], then, is equivalent to [<e>, F'] just in case it picks out the same place, which is to say they pick out the same object of the same kind occupied at that location. If they fail to pick out the same object they are not equivalent.

³⁸ It might be noted that in his appeal to co-ordinates, Forbes thereby assumes a manifold structure, something which the metaphysical relationist rejects. In acknowledging this much, then, he implicitly allows that our prescientific scheme is ‘absolutist’, something I have already urged. His goal, however, is only to reductively identify unoccupied places with places that could be possibly occupied, assuming they are geometrically accessible from the actual world.

³⁹ That is to say, whether acceleration is relative to an absolute space or to material bodies.

Johansson (2004, p. 156) argues against this thought. A *conception* of absolute space is what explains how we can conceive of two qualitatively identical things being numerically distinct. But what principle of individuation does relationism offer? Since the relationist rejects manifold points, what individuates an object is its place in the relational nexus. But how this works is opaque. As Hooker (1971) notes:

“According to RDS [the relational doctrine of space], to be at the position p is to possess some complex relational property. Now it is in the nature of properties that they are instantiated in space, that instances occur at spatial locations and that it be possible that there be more than one distinct, simultaneous instance of any given property. But the complex relational properties of RDS which determine spatial position can of logical necessity have none of these characteristics. Since to be at a position p is, according to RDS, to possess a particular relational property, relational spaces are in effect complexes of universals. Positioning in relational space individuates qualitatively only. But physical space makes possible numerical individuation among qualitatively indistinguishable individuals. This is only possible because qualitatively indistinguishable individuals occupy numerically distinct spatio-temporal locations”. (p. 107, fn. 2)⁴⁰

2. *The Difficulty from the Requirement for Something Else*

While the relationist wishes to urge that space is woven exclusively from objects and relations, something else must nonetheless be introduced to make relationism *intelligible*. This is strikingly so in Forbes’ invocation of a modally and temporally rigid frame of reference. In addition to the set of sufficiently distributed objects at a time (and attendant too the relations between them), Forbes requires a *frame of reference* in order to hypostatise those relations. Essentially, then, the frame of reference plays a role akin to absolute space – it plays the function of individuating objects and relations through the modal and temporally rigid hypostatisation that it, *qua* frame, facilitates.⁴¹

⁴⁰ On relationism, to be ‘at’ a position, p , is to stand in certain spatial relations to other objects - viz. ‘being north of q ’, ‘being left of r ’, ‘being beside s ’ - where here the variables q , r and s designate positions of *objects* Oq , Or and Os . But since this is what ‘being at p ’ means, saying “ x is at p and has the relation Rq to Oq ” doesn’t introduce any further information. But we don’t generally take such information – information about what spatial relations objects bear to each other - to be definitionally true in this sense. Notice too that defining the position p in terms of the relations it holds to other objects involves the hypostatisation of those relations, see above.

⁴¹ Notably, Leibniz’s frame of reference or ‘outside’ is God (though “God is not present to things by situation but by essence” – *Leibniz’s Third Paper to Clarke*, §12, 1989, p. 326). Some relationists even introduce absolute space, albeit only as a theoretical posit – i.e. as part of an *epistemic* ontology (see for example, the ‘Embedding Viewpoint’ deployed by Mundy (1983)).

3. The Difficulty from Possibilities as Truth-Makers

On relationism, what grounds the truth of statements about regions being unoccupied or empty is the possibility of an object being located there. But we typically don't treat possibilities as truth-makers.

4. The Difficulty from Which Possibility

Relatedly, if truth-makers are possibilities, and numerous branching worlds are geometrically accessible from the actual world, as on Forbes' proposed reduction, we might wonder *which* world is the truth maker for the claim that a region is empty?

5. The Difficulty from Impossible-to-Occupy Points

Butterfield (1984) sets out the following worry:

“One difficulty is that it may be impossible to occupy some points. Clearly such a point could not be identified with the set of events that could occupy it: at least, this is so if there are two such points, for then each would have to be identified with the null set and thus with the other.

The relationist will naturally question the claim that some points cannot be occupied. But this claim is plausible when we consider a theory like general relativity, or Newtonian mechanics with geometrized gravity, which is dynamical in the sense that the metric and/or connection is affected by matter”. (1984, p. 107)

Forbes' solution seems to make room for such points – they are logically but not physically possibly occupied. But still, it might be wondered how the relationist marks the distinction between impossible to occupy points – those that are not even logically possibly occupied (e.g. void) - and those that are only logically but not physically possibly occupied.

6. The Difficulty from the Lone Object Universe

For the relationist, a universe with a lone and simple object - one without parts - is not spatial.

7. The Difficulty from the Two Object Universe

Distance is a relation that holds between at least two entities – a single object is at no

distance from itself. But consider a universe composed of exactly two objects. For the absolutist, the distance between these two is given as a function of the set of intervening manifold points. For the relationist, however, the most that can be said is that the objects are *non-contiguous* and so are at no particular distance from each other at all.

8. *The Difficulty from Intelligibility*

Spatial relations are understood by the relationist to be external and hence ungrounded. Still, as I have indicated, insofar as they connect objects and constrain their movement in relation to each other, they are supposed to explain. But how? Without construing them on the absolutist model – that is, as being *made of space* – the essentially *sui generis* nature of the relationist's relations is barely intelligible. This is something Nerlich remarks upon:

“Getting the need for thinkers and understanders out of some enterprise has been the preserve of genius and inspiration has to be a substantial gain....But much that we may be tempted to think of as advancing the cause of philosophy merely deletes the need to understand....[I am not] denying that appeals to intuition and understanding have impeded progress. Early resistance to the non-Euclidean geometries, to the relativity of time, and the like, show how fruitful it can be to break through the barrier set by the demand that new ideas be already intelligible. Nevertheless the risk here is that we will mistake for solutions to problems devices that have merely the form of solutions”. (1994, pp. 30-31)

For Nerlich, the relationist's relations are merely “devices”. But we need to know how such devices *work*. The relationist needs to show then, “not merely that we can cut the realist's ontology to relationist size, but that we should” (ibid., p. 28). She must not merely ‘match’ the realist, as Mundy suggested, she must explain why realism is wrong, and in terms that make a non-virtuous appeal to empty (read absolute) space.

At the outset I noted that phenomenology and even intuition are unhelpful guides in the case of empty space and specifically with regard to our apprehension of it – further evidence for which is to follow – and I noted two reasons that might be offered in support of the strategy this thesis tracks. I noted that we risk leaving certain argumentative paths unexplored when we remain dialectically agnostic on the metaphysical foundations of our perceptual world, and that reflection on metaphysics may even yield philosophical insights about perception, so long as we think metaphysically, not perceptually. So why *Absolutism*?

The mere fact that our naïve conception of space is absolute, and even that relationism is a *phenomenalist* theory, suggests that Absolutism is as good, if not a better noumenal place to start than any other. I adopt Absolutism, then, mostly for expediency, but also because it is possibly true.

In what follows, I will try to be consistent in using the following terminology: The phrase “empty space” is meant to refer to space in a ground sense – the spaces that would be left blank in a sketch. When I simply use the word “space”, in line with the assumption adopted, I mean to pick out absolute space. Occasionally, however, I rely on context to help make sense of *which* empty space – absolute space or empty space in a ground sense – “empty space” is supposed to track.

in nuce:

In this chapter I sketched, in fairly impressionistic terms, the doctrines of Absolutism and Relationism, and, in a little more detail, their dispute over the existence of empty space. In particular, I tried to set out the relationist’s phenomenalist reduction of empty space in a ground sense and the difficulties that attend it.

Efficacious Emptiness

still clad in the home-spun and ill-fitting garments of the fuller of Lymington,
with arms and legs shooting out

- Arthur Conan Doyle, *The White Company*

In the last chapter, I motivated the adoption of metaphysical absolutism as an assumption of the thesis. Here I aim to consider whether empty space can also satisfy the so-called Eleatic principle – the thought that everything that exists must make a causal difference. I don't aim to defend the Eleatic principle, but only to show that, for those who are so demanding, empty space may not, after all, prove so elusive.

Of course, being empty of objects, it might be thought that empty space could cause by omission, something Roy Sorensen suggests. In *Seeing Dark Things*, he urges, echoing David Lewis: “Empty space is deadly. But not because of what it does. Empty space is lethal because of what it fails to do.” (2008, p. 190).⁴² And:

“If you have no protection in the *void*, this would be the least of your worries. Your blood would boil. Not because *empty space* is hot. Rather because empty space fails to exert the pressure needed to keep your blood from boiling”. (my emphasis, *ibid.*)

In this chapter, I argue for a different conclusion. While vacua may well be lethal because of what they fail to do, absolute space has positively efficacious properties too, those that arise from its shape. Space, as I will argue, has ‘structural biff’. To this end, however, it is worth noting a rhetorical slip in the passage above.

Sorensen substitutes “void” for “empty space” (I have italicised the shift). But in the last chapter, I argued in favour of the assumption that empty space is something – it is not nothing, an absence. Yet that it precisely what void is; an *absence of spacetime*. So why think that this distinction, or rather the failure to draw it, makes a difference?

⁴² See Lewis (2004, p. 277).

If one treats empty space as void, as nothing, it can't be perceived – *qua* nothingness, how could it? But assuming that perception causally depends on its objects, in a sense yet to be explored, and supposing that empty space is perceived, it might be wondered whether this requires an attendant commitment to the reality of negative causation. I take up this question in Chapter Four, while here I make a start at assembling the conceptual materials required to make a response. I tease apart two questions that Sorensen's conflation above entangles: I ask whether absolute space is efficacious and, if so, whether it functions as negative cause.

The chapter unfolds as follows. In §1, I outline some desiderata for being a cause that will guide us in the case of space. These are not exhaustive, but rather chart the conceptual terrain that must be negotiated in trying to characterize the causal character, if any, of space. In §2-6, I detail a disagreement between Nerlich and Robin LePoidevin concerning the efficacy of space and suggest that we need not choose between them. Rather, once a distinction is drawn between 'effecting' and 'affecting', we can grant that empty space is efficacious in the following sense: it is apt to affect its occupants. In §4, I offer a brief excursus on negative causation which in turn provides the backdrop for my conclusion. I outline in what sense empty space might be thought to be positively efficacious, though not without some renegotiation of the desiderata noted at the outset (§7-8).⁴³

1.

There is some disagreement over what it takes to be a cause. To make a start at outlining where theorists diverge, I isolate five, non-exhaustive desiderata. This analysis is only cursory but it helps sketch a functional role that will later guide us in the case of space.

1. Insufficiency (I)

Causes are thought to be neither necessary nor sufficient for their effects (see Sosa and Tooley 1993, pp. 5-7); an effect can be brought about another way – causes are

⁴³ I am grateful to Ghislain Guigon for detailed comments on an earlier version of this chapter.

not necessary for their effects. Likewise, since standing or background conditions are involved, the cause is not sufficient; it can't act alone. For example, suppose my blowing out the candle causes its extinction. My blowing out the candle is not necessary for its extinction since a wisp of wind may pre-empt me. Similarly, even though my lighting the candle caused it to light, my lighting it is not sufficient. To light, the wick must be dry.

2. *Locality (L)*

We tend to think of causes and their effects as being in roughly the same region and as occurring at adjacent times; that's why action at a distance is considered so peculiar, that and the fact that in such putative instances of causation the time-like separation of causes and effects fails. Critically, however, this seems to be the case specifically on a conception of causation as *intrinsic*, as something 'in' the objects. Dowe (2009, p. 1), for example, insists: "singular causation obtains in virtue only of local factors, *i.e.* factors that obtain in the spatiotemporal region containing, and stretching between, the cause and the effect".⁴⁴

3. *Reciprocity (R)*

Intuitively we suppose that causes are apt to bring about their effects – that is to say, we assume there must be some *complicity* between the effecting object or event and the effected object or event brought about. C. B. Martin casts this intuition in terms of what he terms of the *Mutual Manifestation of Reciprocal Disposition Partners*. Here's his parade case:

"A typical causal situation is Locke's case of the turning with a particular force a key of a particular shape, size and hardness, etc. in a lock of a particular shape, size and hardness, etc., that is showing a particular force of resistance or lacking of resistance, etc. to the key for their *mutual* manifestation of an unlocking". (1997, p. 204)

Take another standard case. When a billiard ball strikes another, causing it to move, we suppose that it moves not only because the cue was applied with sufficient force

⁴⁴ A regularity theorist might disagree. On a regularity view of causation (RVC), whether two token events instantiate a causal relation depends on whether they instantiate a regularity. Hence, whether a particular sequence is causal depends not merely in the spatiotemporal region stretching between the putative cause and effect, but on occurrences *elsewhere* in the universe (Psillos 2002, p. 68).

and skill, but also because the balls are of a particular shape and rigidity. Such categorical properties ensure that the balls can reciprocally affect each other in the way they do – viz. that the second ball rolls and doesn't shatter (say) on contact.⁴⁵

4. *Connection (C)*

Causation involves a bind or connection between causal relata. This can be spelt out in one of two ways:

Physical connection theorists maintain that a physical connection is a necessary condition for causation, where this is so independently of how the ontology of that connection is understood. For Aronson (1971), for example, the 'A' in 'A causes B', "refers to an object that successfully transfers one of its quantities to the effect object" (1971, p. 422. For Salmon (1993), causal connections are processive - processes, he argues, are the means by which structure and order are propagated or transmitted from one spacetime region to another (p. 169). To emphasise the commonality between both species of theorist, I harness a term used by Lewis (2004) – 'biff'. Call 'biff' whatever it is that flows or is transferred or exerted from one object or event to another, or in virtue of which causal processes are propagated. For the physical connectionist, irrespective of ontology, biff is physical.

The second way in which connections can be elaborated is intrinsically. On such a view, often called ADT (after Armstrong, Dretske and Tooley, its main proponents), no appeal to 'biff' need be made, even if instances of biff-transfer turn out to be symptomatic of what is really doing the causal work: contingent necessitating relations between universals. For example, consider the toy 'law' that all ravens are black. On ADT, this doesn't merely capture a regularity in nature where the properties of being a raven and being black are regularly co-instantiated (which they regularly are). Rather, on the assumption that this *is* a law, it expresses a relation (itself a higher-order universal) between two universals – ravenhood and blackness – where these are co-instantiated *because* there is a relation of necessitation between them

⁴⁵ I return to the role that categorical properties have in grounding dispositions in Chapter Eight.

(see Psillos 2002, p. 162). For the ADT- theorist, this relation of necessitation is intrinsic.⁴⁶

5. *Difference Making (D)*

Causes are typically construed as difference-makers – they are what make a difference (see Lewis 1973). Indeed this is a basic tenet of scientific explanation, at least on a subsumptivist strategy (see Cummins 1985). Here, however, we ought to note, with Williams (2005), an explanatory bias towards *dynamic*, not static dispositions. Dynamic dispositions are those the manifestation of which results in some kind of *change* within a world. In contrast, static dispositions are those the manifestation of which involves no change at all. Rather, their manifestation results only in the “maintenance of the status quo” (2005, p. 204). Such dispositions explain the soundness of a bridge, or, as Williams almost poetically puts it, what it takes for a small table to sit silent and motionless in the corner of the room.

Our question is if and how space meets these (or any of these) desiderata.

2.

In *The Shape of Space* and elsewhere, Nerlich argues that we should resist the urge to think that space is efficacious. He asks us to consider Galileo’s insight that motion in a straight line is unforced, or uncaused. Take a flying arrow. The useful question is not what causes it to keep flying, but why does it ever stop? (Nerlich 2008) What causes it to stop is some *force*; a force might even cause it to accelerate, the wind say. But when the arrow is at rest or moving at a uniform velocity, it is motionless or so

⁴⁶ Of course, it is not a law that all ravens are black, but rather a statement that is true in our world. But consider a truth that also implies a law – say the truth that ‘water boils at 100°’. For the regularity theorist, the truth-makers for this statement are extrinsic - no particular instance of water boiling at 100° can render the statement true. But as such, the regularity theorist has some difficulty in sorting among ‘good’ regularities, as in the case of water, and accidental ones, as in the case of ravens. In contrast, on ADT, an intrinsic *nomical* relation of necessitation holds between the properties of being water and boiling at 100°. The difference with the raven case, then, is that although it is a universal truth that all ravens are black, laws are relationships between universal qualities and quantities rather than particulars that have those properties (and there is, we might presume, no law of nature that nomically relates ravenhood and blackness). As such, laws can be expressed by singular statements about universal qualities and quantities rather than universal statements about particulars (Dretske 1977, p. 253-4).

moving precisely because nothing, no force, causes it to move or to change its track or speed. As such, the explanation of its rest or uniform motion is *non-causal*; it does not invoke a force (“we can speak of causes only when we can speak of forces”, Nerlich 1979, p. 72).

The following case is treated as analogous:

“When I push to get my hand into a non-Euclidean hole, I don’t push against the hole. The push into the hole has to push my body parts against one another (or apart) so as to change the spatial relations among them and give my hand a non-Euclidean shape that can *be* in the hole...I don’t pressure the space and it doesn’t pressure me. I can’t push, pull or twist it; nor can it do that to me. Yet I feel the hole distinctly”. (Nerlich 1994, p. 40)

Here a ‘non-Euclidean hole’ is supposed to pick out regions of space of non-zero curvature. An appreciation of Nerlich’s point, then, requires that we imagine *ourselves* to inhabit worlds in which non-Euclidean holes are there to palpate. In the next chapter and in Chapter Six, I consider what the perceptual consequences of inhabiting such worlds would or could be. Here I try to spell out Nerlich’s contention that in such imaginative cases – those where there are non-Euclidean holes to palpate – the reciprocity of causation is lacking: “I don’t pressure the space and it doesn’t pressure me. I can’t push, pull or twist it; nor can it do that to me”.

Nerlich’s claim is that were we to attempt to ‘squash’ our Euclidean selves into a non-Euclidean region, the geometrical structure of the space would restrict our passage. In attempting to push ourselves through it, the force we would have to apply would just be the force required to change the spatial relations in which parts of our Euclidean bodies stand to each other. Put simply, no outside force could be said to impinge upon or negate our efforts. The space itself would offer no resistance in the manner that an apple meeting the arrow would. Rather, writes Nerlich:

“The explanation of the struggle is that there isn’t the space (isn’t the shape) there for me to fit my hand or body into without the struggle. The structure of the hole independently of my filling it explains things. But not causally – it says nothing about how the hole pushes me or how I push it. It is geometrical explanation”. (ibid., p. 41)

The notion that the shape of things can play an explanatory role is familiar. When C.B. Martin explains the reciprocity involved in an unlocking, he appeals to, among other dispositions, the shape of the lock and key. Or take Hume's billiard balls. The roundness of the balls explains their aptness to roll. In a famous passage, Hilary Putnam argues that the failure of a peg to pass through a hole is best explained not at the vague and ragged micro-level, but at the macro-level – the level that invokes the shape of the peg and the hole. For in such explanation he says:

“certain relevant structural features of the situation are brought out. The geometrical features are brought out. It is relevant that a square one inch high is bigger than a circle one inch around. And the relationship between the size and shape of the peg and the size and the shape of the holes is relevant”. (1975, p. 296)

Nerlich's thought is somewhat analogous, though it does not involve appeal to the structure of material (just as for Putnam there is no need to invoke the geometric properties of immaterial space). Still, there is a commonality in both species of explanation. It might be thought that the explanatory role played by *shape* is non-causal. The failure of the peg to fit the hole does not depend on anything that the hole *does* to the peg.

Consider another example, one closer to the world we are in. Below is an illustration of an eggshell-shaped space (adapted from Nerlich 1994, p. 83). ‘*x*’ is a patch of paper.

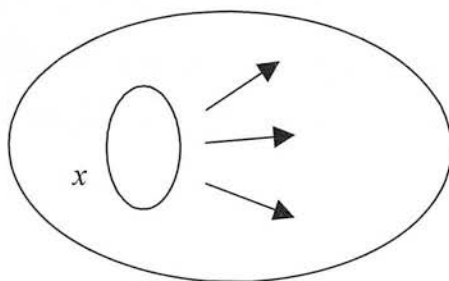


Figure 2: An egg-shell shaped space

In contemplating its freedom of movement, Nerlich writes:

“Clearly, a thing in the two-space defined by an eggshell cannot move freely about it without changing its shape [this thing is *x* in the

figure above]. If [x...] were a paper patch lying on the eggshell, then it would tear if we tried to fit it onto flatter areas near the middle of the shell, or it would wrinkle if we tried to fit it onto the more acutely curved regions near the 'pointed' end. If it were to slide along the space then it would have to deform like an elastic thing (stretch, not merely bend) or it would resist the motion." (ibid, p. 83)

So, if the patch were to move closer to the edges it would have to wrinkle to 'fit'. Likewise, it would tear if we tried to spread it on the flatter, less curved region in the middle. By analogy, think of trying on an ill-fitting garment, a jumper say. To fit the girth or shape of the underlying body, it may have to stretch, or, if its sleeves are too long, it may wrinkle at the wrists and have to be rolled up. The analogous idea is that matter may have to change shape to take up paths in space that are peculiarly curved or shaped.

Of course, our experience of space is not like this. Unlike the patch paper, or an ill-fitting jumper, things do not change shape, they do not wrinkle or spread in trying to move through regions of empty space.⁴⁷ But this in turn suggests that the shape of space in our vicinity is of relatively constant curvature; it does not require that we, or items in it, change shape in order to move through it. Indeed, as Nerlich writes, "our experience of how things move in space suggests they are very freely mobile" (ibid.). But, as such, the shape of space explains our free movement in it. For Nerlich, since such explanation appeals to the geometric properties of space, it is non-causal.

Now, one motivation for insisting that the shape of space explains geometrically, not causally, is that, as Nerlich writes in *The Shape of Space*, "there is still no consensus yet on what we mean by cause" (ibid., p. 41). In a much earlier article, however, he writes:

"I take cause to be, fundamentally, a relation among events, causal efficacy to require one event to make another happen or, at least, one thing's having a disposition to change another which is manifested under certain conditions (elasticity is manifested in collisions, for example)". (1979, p. 70)

⁴⁷ Naturally the patch and garment do not move through the surface they try to cleave to – the egg-shell or the body of the wearer. They move *over* it. Still, I hope the analogy is clear: the idea is that the shape of the items must change as a function of the shape of the area they move through or over.

On these grounds, then, Nerlich might be thought to endorse desiderata (R) and (D), while later we find him writing that “space absorbs no energy, exerts no force, enters no reaction” (ibid., p. 78). To this extent, then, he seems to embrace a physical connections reading of (C). Indeed, a broader sense of causal efficacy is, he notes, “a deviant one” (1979, p. 70). I return to this charge below. First, I consider one final explanation (or at least from the point of view of this exposition) the shape of space, as Nerlich contends, provides.

It is a familiar fact that our hands are ‘handed’ and so cannot be made to coincide with each other, a point which intrigued Immanuel Kant. In *Concerning the Ultimate Ground of the Differentiation of Directions in Space*, he observed, “the limits of the one cannot also be the limits of the other” (1992 [1768], p. 369), later noting that the surface enclosing the space of one hand “cannot serve as a boundary to limit the other, no matter how that surface be twisted and turned” (1992 [1768], p. 371).⁴⁸ Cast somewhat differently we may say that worlds in which they *do* coincide are geometrically inaccessible from the worlds we are in – recall, this notion was spelt out when considering Forbes’ phenomenalistic reduction of unoccupied places. For example, if we embed an ‘L’ in a two-dimensional Euclidean plane, like this sheet of paper, it is asymmetric. But if it is embedded in something like a Mobius strip, it can be moved rigidly around the space such that it can be folded back on itself – viz. so that the limits of the one *can* be the limits of the other (see Nerlich ibid., p. 71).

Now, the resources available to the relationist and absolutist to explain the accessibility or otherwise in these cases are distinct. For the relationist, geometrically inaccessible worlds are simply those at which certain counterfactuals fail to obtain. So the ‘Mobius strip world’ is distinguished from the ‘sheet world’ in terms of the bare holding of distinct counterfactuals. Unlike the relationist, however, the Absolutist has an *explanation* as to why distinct counterfactuals hold – the worlds are not distinguished *by* the bare holding of distinct counterfactuals, rather they are distinguished by what *grounds* the holding of those counterfactuals in the first place; namely the shape of the relevant region. On this understanding, then, but not the first, what paths are available to an occupant of a particular space depends on the shape of

⁴⁸ Both quotations come from Pooley (2003, p. 252). See also Nerlich (2009).

the space it inhabits. Hence, what the occupant can do, or what can happen to that occupant, depends on the shape of the region. For Nerlich, explaining this much requires a style of explanation that is non-causal since, just like the peg and the hole, space doesn't *do* anything – it doesn't “sustain the handedness of objects by some action it performs upon them or some disposition it has to make things handed (or not)” (ibid., p. 72).

It might be wondered, then, whether this conclusion does not make tempting a move to relationism after all - if space doesn't do anything, why admit it into our ontology? What Nerlich shows, however, is that the non-efficacy of space is in fact *no reason to doubt its reality*. Space *does* do something: it *explains*, albeit non-causally. What's more, the relevant explanation is grounded; it is grounded, appropriately, in the shape of space. To wit:

“I take geometrical explanation, a kind that calls on local or global shapes for space, to be a kind of explanation all its own. It is like causal explanation in that it explains events, and like it in that the explanans needs to be understood as a real concrete thing for the explanation to make sense”. (ibid., pp. 41- 42)

Hence, the charge that empty space is inefficacious does not require that we side with the Eleatic stranger – as Nerlich puts it, to be an explanans, empty space must be real and concrete. In §4, I consider a distinct account that meets the stranger's demands – that set out by LePoidevin (1992). First, however, I say a little about negative causation, so going some way towards teasing apart the two questions I took Sorensen's collapse to entangle at the outset.

3.

Above, I sketched an attempt by Nerlich to show that not all explanation is causal. The shape of space explains geometrically. Allowing this much, then, requires that we expand our notion of *explanation* while preserving a certain understanding of causal efficacy; one on which one event is required to make another happen, “or, at least, one

thing's having a disposition to change another which is manifested under certain conditions” (Nerlich 1979, p. 70).

A somewhat different tack, however, is to expand instead our notion of *causation*, and to preserve the thought that all explanation is causal. LePoidevin, who observes that Nerlich’s take on causal efficacy is “narrow” and “mechanical” (1992, p. 151), adopts this strategy. In §4, I show in what sense LePoidevin’s broader understanding, one which Nerlich would no doubt dub “deviant”, is thereby akin to treatments of *negative causation* that I designate here as ‘functionalist’. I spell out the import of this designation here.

An expedient way of bringing the notion of negative causation into view is to consider the ‘neuron’ diagrams below. The first diagram represents causation by omission, while the second represents positive causation. Conventions are as follows. Filled circles represent firing ‘neurons’ or occurring events, while unfilled circles represent non-firing ‘neurons’ or absences. Arrows represent ‘stimulatory synapses’ or physical connections, while lines terminating with black dots represent *inhibitory synapses* or preventions (see Schaffer 2000, also Armstrong 1999).

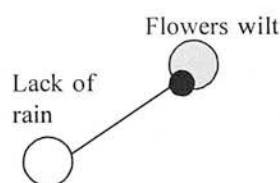


Figure 3: Causation by omission

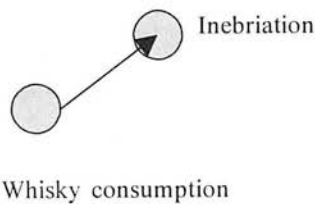


Figure 4: Positive Causation

The first diagram represents causation by omission - the causal relation is represented by the line terminating in a dot - while the filled circle in the second diagram represents the positively efficacious power of whisky to inebriate; hence the arrow. Together these help us sort among two broad species of causal theorist.

A *genuinist* about negative causation is a theorist that acknowledges the existence of causal relations terminating in a dot, while a *non-genuinist* admits only biff-like or intrinsic connections; those represented by an arrow. For the genuinist, then, unfilled circles represent *genuine entities* which can act as causal relata – hence the presence of an inhibitory synapse terminating in a dot. For the non-genuinist, however, since absences are not genuine entities, they cannot ground or field the causal relation. The non-genuinist, then, rejects the notion that the first diagram represents a causal event of any species; by non-genuinist lights, the genuinist take on causal efficacy is “deviant”. So how does the genuinist justify such deviancy?

Schaffer (2005, p. 329), a genuinist, lists four reasons.

First, causal explanations that invoke absences, lacks, failures, preventions or omissions are intuitively acceptable – for example, we accept that the room is in darkness because the curtains are drawn (and so prevent sunlight from entering).

Second, explanations of the form ‘an absence of x caused y’ are ubiquitous in the empirical sciences – a lack of vitamin D is said to cause rickets (see Schaffer 2004, p. 202 for a host of examples).

Third, absences play the moral and legal role of causes and effects – one can be tried and found guilty for not doing something, as in cases of neglect, or for failing to prevent the occurrence of something – for example, the bank clerk that fails to lock a safe may fail to prevent a robbery (and so too the occurrence of *another* absence; namely of money in the vault).⁴⁹

⁴⁹ For an account of negative action see Varzi (2007).

Fourth, causative verbs of ordinary language include verbs of disconnection – i.e. uncouple, disengage, part, untie, cleave, disjoin, rend. But since negative causes often cause by disconnection (the curtains cause the room to darken because they ‘cut off’ the sunlight that would otherwise have entered), this too seems evidence for a species of causation mediated by absence or non-occurrence.

For such a theorist, then, what is emphasized is the *functional* role that absences play in our explanatory practices. As such, the notion of causation is functionally defined. For example, Schaffer (2004) recommends the following strategy:

“Conjoin our most central platitudes involving the concept, replacing the term “causes” by the variable *R*, and uniquely existentially quantifying over the conjunction. The best satisfier of this definition then deserves to be considered the best candidate to be the meaning of our actual concept. The central platitudes involving causation are to be drawn from the conceptual connotations, paradigm cases, and theoretical applications of the concept. Thus the functional definition of causation will look something like:

“There exists a unique relation *R* such that: *R* is associated with counterfactual dependence & *R* is associated with statistical relevance & *R* is associated with agential means & *R* is necessary for inferential evidence & *R* is necessary for explanation & *R* is necessary for moral responsibility & . . . & *R* holds between heart damage and death & *R* holds between trigger pullings and gun firings & *R* holds between volitions and actions & . . . & *R* secures the reference of names & *R* is involved in rational decision & *R* is the genera of perception &...”. (p. 206)

Call such a theorist a *causal functionalist*. Unlike the non-genuinist, whose rejection of absence causation might be thought to stem from the inability of absences to ground causal relations, the functionalist does not require causes to be grounded at all (though in some cases they might be). And this is because, as the above passage illustrates, the functional definition of cause *itself* appeals to explanatory considerations and so cannot be thought of as grounding them. As such, the functionalist might be thought to expand the notion of causation while treating all explanation as causal – a cause is just whatever explains.

Finally, it is worth noting something about the ontology of absences which the representation above may obscure.⁵⁰ Absences are spatially located. When flowers wilt due to a lack of rain, there is a place at which there is a lack of rain, or at which rain is absent. I return to this point in Chapter Five. In the next section, I consider LePoidevin's argument in support of the claim that space is efficacious.

4.

Le Poidevin (1992) notes two reasons that might lead to a rejection of the claim the space is efficacious:

First, whatever intrinsic property we attribute to space or its parts, all regions are homogeneous with respect to that property. Hence, since causal laws are invariant across regions, no particular region can make a causal difference since all regions are the same. Call this the *Homogeneity* worry.

Second, even if we argue that the topological properties of space are causally explanatory of the behaviour of objects, such properties are global. But desiderata (L) said that we ought to seek out causes at particular or local spatio-temporal locations. Call this the problem of *Locality*.

Now, in responding to these concerns, LePoidevin's strategy is to appeal to just the considerations Nerlich does. Rather than being homogenous, spacetime regions differ intrinsically as a function of their curvature. But notice this defuses both worries at once. Regions are not homogenous after all, and local geometric properties *can* make a difference to occupants of that region, namely as a function of their durations or convolutions. With this much established, then, LePoidevin makes the following move: He seeks to argue that particular, local regions of space are causally efficacious in virtue of their geometric properties. But, we might wonder, isn't this just the thesis *Nerlich* denies?

⁵⁰ See Maudlin (1990) on the importance of the distinguishing the ontology of the representation from the ontology of what is represented.

Nerlich, recall, treats space as inert. Since space absorbs no energy, exerts no force, enters no reaction, it cannot enter into reciprocal relations with its inhabitants. To diffuse Nerlich's claim, then, LePoidevin must address *two* assumptions implicitly underpinning Nerlich's reluctance. First, that causality must involve some kind of biff-like transfer or connection, and second, and relatedly, the thought that empty space thereby fails the reciprocity desideratum. He deals with the first assumption quickly:

"Graham Nerlich considers geometrical explanation - that is, explanation of the behaviour of objects by reference to the geometrical properties of space - to be non-causal because "Space absorbs no energy, exerts no force, enters no reaction" ([1979], p. 78). But this is to take a rather narrow, mechanical view of causation. Is it obvious, for example, that causal interaction essentially involves energy transfer? How would mental causation fit into Nerlich's characterization? Perhaps causation does have mechanical connotations, but if causal potency is to be used as a criterion for something's existence then the consequences of a restrictive conception of causality will be an impoverished ontology." (ibid., p. 151)

LePoidevin, then, would rather *expand* our notion of causation than render explanation heterogeneous (at least in this instance).⁵¹ But to this extent, he might be cast as a causal functionalist. The second objection offered is a little more substantive. He aims to show that space *can* meet the reciprocity desideratum. His argument runs as follows:

On the General Theory of Relativity, the distribution of matter in space affects its curvature. A change in the distribution of matter then should effect a change in the shape of space. The critical question is whether this change occurs simultaneously.

The reciprocity required for causation requires that change is *non-simultaneous* – we typically assume that cause and effect are time-like separated. But if so, a puzzle arises. Given that we are talking about space-time, if *times* are distinct, *then so are the regions*; there can be no change in regions across times since, at any given time, *the*

⁵¹ In Chapter Four, I outline his notion of chronometric explanation.

regions are distinct. So how can there be causal change in a region at all? Either way, we are left with a paradox:

“the action is supposed to be a reciprocal action: the change in the distribution of matter results in a change in the curvature which in turn produces a change in the distribution of matter. That is, the effect of the distribution of matter on spacetime results in a change in that distribution”. (ibid., p. 152)

But if that change is simultaneous – viz. if a change in distribution of matter results in a change of curvature - then this would entail that *one region has two distinct geometries at a time* (viz. since a change in the distribution of matter is caused by change in curvature). Yet by the same token, if the relevant causation is non-simultaneous then this, as noted, entails that *same region persists at two distinct times*, which, in a spacetime context, makes no sense. LePoidevin then makes another move:

He argues that to cause a particular (in this case some matter) to have some property (in this case some distributional property) is not necessarily to bring about a change in that particular at a time *even if change is involved*. I spell this idea out using the example that LePoidevin offers as illustrative.

Consider a particle created at one moment and annihilated at the next and which has some intrinsic property G. He asks: “Are we to say that there cannot be a cause of this particle’s being G because there is no time at which it was not G? Of course, not” (p. 153). Rather the cause of the particle’s being G *precedes its existence*. But likewise, the dependency of the geometry of a region on a particular distribution of matter need not involve a change in the properties of that region at a time (the analogous question is: “Are we to say that there cannot be a cause of a region’s having a particular geometry at a time because there was no time at which it did not have that geometry? Of course not”). Rather the way matter was distributed *earlier* can affect the curvature *later*, and vice versa – the way the curvature was earlier can affect the distribution of matter later.

This idea is spelt out in terms of future light-cones; the sum of all paths that light emanating from a single event would take in all directions. He writes:

“What we should say then, is that the distribution of objects in a given region affects the curvature of spacetime only in the forward light-cone of that region, *not in the region itself*. Similarly, the curvature of a certain region affects the distribution of objects only in the forward light-cone of that region”. (my emphasis, *ibid.*, p. 153)

Hence, the relation *can* be reciprocal without entailing that the same region persists at two distinct times. This completes LePoidevin’s argument for the efficaciousness of space.⁵² How compelling, though, is his case against Nerlich?

Nerlich seems to require both that we admit a distinct kind of explanation – geometric explanation – and that we embrace non-causal criteria for admitting something into our ontology. We might therefore welcome LePoidevin’s more inclusive functionalist take on causation, which anyway preserves Nerlich’s primary insight – namely, that the shape of space explains the character and nature of the movement of objects in it. (As Nerlich notes, this causalist thesis “is an obvious boost to the idea that space is a real, concrete, mediating thing” (1994, pp. 40-41)). Even so, it appears to me that Nerlich’s worry remains. Consider again the case of attempting to push one’s hand inside a non-Euclidean hole. Nerlich urges:

“The explanation of the struggle is that there isn’t the space (isn’t the shape) there for me to fit my hand or body into it without the struggle. The structure of the hole independently of my filling it explains things. But not causally – it says nothing about how the hole pushes me or how I push it. It is geometrical explanation”. (*ibid.*, p. 41)

So how should we adjudicate? In the next section, I suggest that we may not have to – a conciliatory thesis can be advanced.

⁵² It might be objected that this account undermines our intuitive conception of the causal relation as *transitive*. Hall (2000, p. 198) for example, writes: “That causation is, necessarily, a transitive relation between events seems to many a bedrock datum, one of the few indisputable a priori insights we have into the workings of the concept”. I agree that causation is transitive. However, the thought that causation by spacetime disrupts our concept of the transitivity of the causal chain arguably only makes sense on the implicit assumption that causal partners need to be path-connected.

Notice that on both LePoidevin's account for the efficaciousness of space, and on Nerlich's argument against it, distinct (ostensible) causal partners are arguably posited. LePoidevin claims to discover a reciprocity between the distribution of matter in space and its curvature; the relevant causal partners, then, are *matter* and spacetime. For Nerlich, however, a lack of reciprocity is found between *particulars*⁵³ in space – me and my hand or body – and space itself, where space is found to “absorb no energy, exert no force, enter no reaction.” But this being so, perhaps we need not choose between them.

LePoidevin aims to causally explain the shape of spacetime; we causally explain its topological and geometric properties as a function of the distribution of matter in it. But Nerlich seeks to explain the behaviour of particular objects in space over time, namely, by reference to its geometrical properties, where those properties are fixed – “the structure of the hole independently of my filling it explains things” (ibid., p. 41). Recall, however, that LePoidevin's account explains how a certain distribution of objects in a given region can affect the curvature of spacetime *in the forward light-cone of that region*. It is consistent then with LePoidevin's thesis that the curvature of space *is fixed at a time*. But this suggests grounds for a conciliatory thesis.

Earlier, we noted C. B. Martin's claim that cause and effect should be explained in terms of the mutual manifestation of reciprocal disposition partners. On such an understanding, the relation between distribution of matter and the curvature of spacetime can be construed as reciprocal, and hence, as LePoidevin insists, causal. Not so, however, the relation of particulars to the space in which they are located – a point Nerlich urges. But this seems puzzling. Some particulars *are* material. So both theses cannot be right. Take some material particular *x*. It seems that both (a) and (b) below cannot be jointly held.

⁵³ Here I mean particulars in the ‘entities’ sense – see Chapter One.

- (a) x causally affects the curvature of spacetime – *LePoidevin's Thesis*
- (b) x enters into no causal reaction with space – *Nerlich's Intuition*

I suggest, however, that once we recognize that we can individuate x *either* as a particular or as a fragment of matter, both can be accommodated. To develop this notion further, I note a distinction detailed by Mellor (1995).

Mellor suggests we distinguish between causation that *brings something into being*, and causation that merely *affects* something already existent:

“Kim gives her father-in-law,...an injection to make his death painless. The injection affects his death, but does not cause it. Here the affected particular is an event. But things too, including people, can be affected. In perception, for example, we are affected but not caused by the things we see and hear”. (pp. 140-144)

Call a cause that brings something into being *effective* - it's action *effects*. And call a cause that affects things already existent one that *affects* those entities. If LePoidevin's account is correct then the following ought to be said: The curvature of spacetime *effects* the distribution of matter in it – it brings into being a certain constellation of matter in the forward light-cone of that region. Even so, as Nerlich recognises, it merely *affects* particulars; it constrains the way they move for example.

It seems to me, then, that the following resolution is plausible and attractive: The mutual manifestation of reciprocity applies to the distribution of matter and the curvature of spacetime, *not* to particulars and the space in which they find themselves. Hence, even while space *affects* particulars, particulars, *qua* particulars, are powerless to affect space (unlike particulars, *qua* fragments of matter which do effect the curvature of spacetime). Thus, space is efficacious in its power, not to *effect*, but to *affect* – it constrains the movement of material particulars in space.

Notice, then, that this requires endorsing an expanded, or as Nerlich would have it, “deviant” understanding of causal efficacy. Still, it preserves the idea that explanation is causal – causes are what explain. On this expanded view, then, emptiness is efficacious. But whether or not this more inclusive strategy is compelling, what is

important is the insight from which it ultimately derives - Nerlich's insight that the shape of space is explanatory. Henceforth, I use the term 'affect' in this technical sense and I treat it as causal. As such, I am inclined to adopt a functionalist approach, though admittedly I adopt this without argument.

6.

So far I have considered two realist arguments that disagree over whether space is efficacious. Nerlich urges that space is not a cause but nonetheless explains. He thereby advocates a distinct species of explanation – geometric explanation. In contrast, LePoidevin, who is also a realist, essentially suggests that we can embrace a less mechanical notion of cause so as to allow that space, insofar as it can effect changes in distributions of matter, is efficient. As I have noted, such a view might be considered functionalist in its characterization of causation.

Now, at the outset, I unraveled two questions that seemed to be conflated on Sorensen's identification of void and empty space: the question as to whether empty space is efficacious and, if so, whether it functions as negative cause. We are now in a position to offer a response.

Drawing on both Nerlich and LePoidevin, I have tried to generate an argument for the efficacy of empty space. I have suggested that it is efficacious in its power, not to *effect*, but to *affect*, and I have argued, after Nerlich, that this flows from its shape. But this in turn explains why empty space has positive efficacious properties after all. The aptness of space to affect flows from its shape. As such, it might be suggested that empty space has structural biff. I gloss this notion below. Even so, a question remains. Surely, empty space, *qua* cause, is peculiar precisely because it is empty. Does it not then act as a negative cause?

It seems to me that whether or not space can be said to act as a negative cause depends on what effect is in question. Void is lethal because, as Lewis explains:

“you are kept alive by the forces and flows of energy that come from the objects that surround you. If instead of objects, you were surrounded by a void, these life-sustaining forces and flows would cease”. (2004, p. 277)

This, then, is how the void causes *death*. It is deadly not because it exerts forces and supplies energy, but because it doesn’t.⁵⁴ But the ostensible ‘effect’ I aim to consider, and which an appeal to negative causation might be thought to explain, is the perception of empty space.⁵⁵ I return to this issue in Chapter Four. In the remainder of this chapter, I consider negative causation in a general sense, and I explain in what sense the power of empty space to affect is not thereby negative.

Consider why the non-genuinist rejects negative causation.⁵⁶ Three worries can be advanced.

First, absences simply lack biff; they are propertyless.

Second, and relatedly, absences generate what Lewis (2004, p. 281) calls ‘The Problem of the Missing Relatum’. Relations need relata, but absences are nothing. Hence, if causal interaction involves biff, to what or where is the biff transferred or propagated? On the other hand, if causation involves necessitation relation between universals, as the intrinsic connections theorist has it, what can ground or ‘field’ the relation?⁵⁷

Finally, negative causes must be located; they must be located along a path *where biff would otherwise have flown*. For some non-genuinists, this is problematic. Hall (2002, p. 279) for example writes:

“right now I am typing on my computer at home, and hence fail to be typing on the computer in my office. Assuming this omission has a location, is it taking place there or here?”

⁵⁴ Notably, Lewis does not make the slip Sorensen does (see also Chapter 1). Still, when it comes to absences, “the void is like the vacuum only more so” (2004, p. 278).

⁵⁵ See Snowden (1990) for a critical discussion of the idiom of cause and effect when applied to experience.

⁵⁶ See Beebe (2004) for a detailed treatment of this dismissal.

⁵⁷ As Armstrong, an intrinsic connections theorist, urges: “[e]very causal situation develops it does as a result of the presence of positive factors alone” (1999, p. 177).

With these concerns in mind, it might be wondered: Do the same worries apply in the case of space? If so, some parity would be revealed that might in turn explain Sorensen's indifferent treatment of void and empty space.

As noted, the non-genuinist theorist disputes the plausibility of causation by absence on the grounds that absences are propertyless – they are nothingnesses. But if the argument advanced so far is correct, and, of course, if absolutism is assumed, then this is simply not true in the case of empty space. Empty space has topological and geometric properties that explain its power to affect. But, as such, it is not after all biffless. It has, I suggest, *structural* biff.

One might think of structural biff on an Aristotelian model, not as involving efficient or material causation, but as formal, where here, of course, it is not the arrangement of matter that counts but the structure of immaterial empty space.⁵⁸

So what about the problem of the Missing Relatum?

One motivation for pressing this worry is that absences are propertyless, and hence have no properties to ground the relation that non-genuinists insist is required for causation. I have argued above, however, that unlike absences and omissions, empty space is not after all propertyless; it is a *bona fide* entity. Even so, the problem of the Missing Relatum has some intuitive force. After all, what could be grounding the relation in the case of empty space?

As I have indicated, for a non-genuist who believes in biff-like causation the causal relation is conceived of as operating *through* space; causal relations are path-mediated physical connections. Hence, if there is nothing at some place, there is nothing to ground the relation. But consider, in contrast, the case of space. Particulars are not path-connected to the space they are in. Yet this does not mean that the *relatum* – space – is missing.

⁵⁸ Of course, the notion of formal causation is meant to apply to *material* causes of a certain form. My suggestion is that the form of immaterial space can be likened to the Aristotelian notion of a formal cause.

Something is 'missing' if there is *somewhere* where it could have been but isn't. Since, however, space *is that somewhere*, it is a condition on something being present or missing in the first place. Hence, to the extent that the relatum is not *in* space, it is 'missing' – viz. it is absent at some place (naturally since *it* is the place where absences or presences are located). But to the extent that it exists – *it is space itself* – it is very much present. I pick up this thought in Chapters Four and Five.

Finally, Hall objects that absences are not located. But naturally, nor is space – as I have indicated, things, including absences, are located in it.

Space, then, does not then act negatively, or not merely so. Rather, as I have argued, it has structural biff.

7.

At the outset, I gave a set of non-exhaustive desiderata. We are now in a position to consider the case of space in light of these. So far I have implicitly addressed desiderata (C), (R) and (L).

I have suggested that the aptness of space to affect need not involve a *connection* whereby causes and effects are understood to share the same space. Space is apt to affect its occupants, but they do not share the same space. Rather they are in it.

Likewise, *reciprocity* can be understood to hold so long as the relevant causal partners are spacetime and matter. Where fragments of matter are individuated as particulars, reciprocity fails.

Finally, locality need not fail in the case of space so long as it is granted that local causation need not operate through space. This is because local spacetime regions differ in their intrinsic curvature, and are thereby apt to exercise their affect at those regions.

What about the remaining desiderata?

Our first desideratum – *Insufficiency* (I) - said that causes are neither necessary nor sufficient for their effects. But since space places necessary constraints on the movements of objects, this seems undermined. We can, I think, circumvent this worry.

First, (I) can be honoured once we acknowledge that the relevant necessity applies only to spaces of certain dimensions. If space were of four dimensions then we would be constrained to move in four dimensions, not three, and surely it is not necessary that the space we are in is of three dimensions.

Second, since our question concerns the efficacy of empty space, it is certainly true that, *qua* affective cause, space *is* insufficient for its effects. Why? Because entities to affect – particulars - are also required. So how about our final desideratum?

(D) insisted that causes are difference makers. But, as I will argue, space *is* a difference maker. The shape of space can make a difference to how and where things move. But as such, as I will explain, it makes a difference to how empty space appears and feels.

I pick up this thread in the next chapter.

in nuce:

In this chapter I have argued that in granting that empty space is efficacious, we need not insist that it is efficacious in virtue of what it *fails* to do. Rather, empty space has positive causal properties that *affect* the way objects move. The biff possessed by empty space is structural.

Clearing The Ground

While at our feet, the voice of crystal bubbles

- John Keats, *I Stood Tip-toe on a Little Hill*

In *Philosophical Investigations*, Wittgenstein remarks of St. Augustine's enquiry into time:

"Something that we know when no one asks us, but no longer know when we are supposed to give an account of it is something that we need to *remind* ourselves of" (1997, p. 42, §89).

Less often quoted is the sentence in parenthesis that follows: "And it is obviously something of which for some reason it is difficult to remind oneself". In this chapter, I argue that what is true of time is also true of empty space and specifically our apprehension of it, and I try to provide the requisite 'reminder'. I argue that we see empty space. My dialectical strategy is to consider two ways of making sense of this claim.

First, I examine the notion that we see empty space by perceiving the surfaces of objects. Then I consider an ostensibly more radical claim – the claim that empty space has a look. On this understanding, but not the first, empty space has visible properties. Drawing once more Nerlich, I try to make this thought intelligible. I argue that the look of space flows from its shape, which in turn explains the peculiar difficulty in 'reminding' oneself in the case of empty space; because empty space is uniformly flat and colourless, we tend to overlook its appearance.⁵⁹

The chapter unfolds as follows. I begin by spelling out why appeal to untutored phenomenology is, in the case of seeing empty space, apt to puzzle (§1-2). In §3, I

⁵⁹ In Chapter Five, I outline an alternative account of seeing empty space – the Structural View defended by Richardson (2010) and Soteriou (2011).

outline an account on which one comes to be aware of the presence of empty space by perceiving the surfaces of objects. I detail in what sense this position might lead one to accept commitments that are otherwise unattractive. In §4, I outline what seems, on the face of it, to be a more radical thesis – the idea that empty space has visible properties that are directly perceived. I explain in what sense the view I outline differs from that of Graham Nerlich, to which it is otherwise indebted (§5). In §6, I sketch a way of domesticating the claim that empty space has visible properties. M. G. F. Martin proposes that the visible properties of individuals are those that warrant comparative statements of the form ‘*x* looks *F*’. By appeal to such claims, I try to characterise the look of empty space. I argue that it looks ‘clear’ and ‘see-through’. I close by countenancing some objections (§7).⁶⁰

1.

Naively, unreflectingly, we might happily take ourselves to perceive empty space. When we see someone across a crowded room, we might be thought to see the space that separates us. To use the metaphor introduced in Chapter One, when sketching a room, we know what to leave blank – the bits representing the empty space that, when we look up from our sketchpad, we can see. Likewise, just as we can erase an object to leave that bit of paper blank, in removing some object from a place – a chair say – we might suppose that we can bring empty space into view.⁶¹

⁶⁰ I am grateful to Kevin Mulligan and Sean Enda Power for comments on an earlier draft, as well as to an anonymous reviewer at the *European Journal of Philosophy*. Some of the material in this chapter was presented at a Work In Progress seminar at Edinburgh University and at a Philosophy and Psychology Seminar at the University of Glasgow.

⁶¹ The thought that empty space has an appearance, at least under certain conditions, is not entirely without precedent. In a 1925 paper entitled “The Glassy Sensation”, E. F. Möller assesses a claim made five years earlier by F. Schumann. In his ‘*Die Repräsentation des leeren Raumes im Bewußtsein. Eine neue Empfindung*’, Schumann had reported that, under certain circumstances, subjects were found to describe empty space as filled with a “glass body”, “frozen air” or “transparent ice”, a fact which he equates with the discovery of a new sensation, a ‘glassy sensation’. Möller presents as his task the description and determination of this sensation, and the conditions of its arousal. A series of bizarre phenomenological reports are detailed, including the following (pp. 280-283):

“I glanced up at the treetops and saw the branches held rigidly apart by some solid medium which was perfectly transparent, yet plainly there before the gray of the sky. It seemed to hold the branches stiffly, as if they were frozen in it.”

“I saw the library and the snow as if they were all set in a glass paper-weight. I almost expected to walk into a wall of glass, only the wall was all around me too.”

Still, when we think about it we might begin to wonder. For example, some of our intuitions could be cast very differently. When we see someone across a crowded room, perhaps we only see *that* we are spatially related to them. When we leave blanks in our sketch, perhaps we depict regions where there is *nothing* to see, not regions where something – empty space – is seen.⁶² In seeing a paper cut-out, say of a castle, we may only see a peculiarly holed object, one with an odd morphology, not the empty spaces where paper has been cut out to form the battlements.

Such thoughts may recruit some elementary metaphysics: If empty space is nothing, how can it be seen? If space is or involves absence, and absence is powerless, how can it shore up in our perceptions? How can there be anything but matter? These issues were partly addressed in Chapters One and Two.

Yet intuitions aside, and without thinking metaphysically, even *phenomenology* might give us reason to pause if asked whether empty space is seen, at least if our introspective reflection is also guided by a folk psychological account of seeing. For example, we might suppose that we only see what is coloured, and space is colourless. Not dissimilarly, one might reason, drawing on some introductory physics, since light passes through empty space, it is transparent, and so invisible.

I begin by explaining why such reflections are not conclusive – it is just not *obvious* that empty space is thereby invisible.

“I suddenly saw that the glass in the door was no longer a thin sheet, but was now merely part of the bulk that extended into the next room as far as I can see.”

Notably, Möller concludes that this appearance has a central origin, and so is not sensory. See Mausfeld (forthcoming) for contemporary reflection on this “sensation”.

⁶² Recall that in Chapter One I motivated absolutism as an assumption.

Transparent materials neither absorb nor reflect light but allow it to pass with very little or no loss. Air is transparent, as is refined glass. Naturally, space is not material but, like transparent media, light passes through it. So is it not, then, invisible?

For Mizrahi (2010), transparency and invisibility “go hand in hand” - the more transparent, the less visible.

“Transparency and visibility therefore appear to be opposite notions. In order to see behind or through a body, there must be no visible obstacle. If a body is spatially located between the observer and the background, the background is visible provided only that the intermediate body is not seen”. (p. 4)⁶³

Of course, transparent things are not *always* invisible. If glass is smudged or smeared, it is visible. Or if its boundaries or edges can be seen, perhaps because they are thicker and invite refraction. In his neglected paper “Thing and Medium”, Fritz Heider explains why this is so. In such instances, the glass no longer acts as a medium:

“One cannot get much information about a transparent pane of glass as long as one lets it act as a medium. One can look through it as if it were clear air. Only if one touches it with one’s hand (...) can one get information about the pane itself. This is also the case when it is possible to see its edge, or when one sees it from the side and notices a thin glittering line. In all these case it does not act as a pure medium”. (1959, p. 49)⁶⁴

But glittering lines aside, perfectly clean glass *is* invisible, and typically we don’t wonder why. As Mizrahi puts it, canonically, I think:

“For an object to be transparent it must be invisible, whereas to be colored an object must be visible.” (ibid.).

On this understanding, transparent objects are invisible because they are colourless, and something is colourless when it neither absorbs nor reflects light but allows it to

⁶³ This page number refers to an online version of the paper – see bibliography.

⁶⁴ I am grateful to Kevin Mulligan and Olivier Massin for bringing Heider to my attention.

pass with very little, or no loss. Yet where transparency and visibility are polarized in this way - that is, with respect to colour - then, on the assumption that empty space is also transparent, it disappears from view. But we need not accept either assumption.

First, though it is true that empty space transmits light with no loss, we might reasonably insist that the predicate “transparent” apply only to material things or substances that *occupy* space.

Second, we could dispute the seeming extrapolation that moves from the invisibility of transparent things to the invisibility of empty space on the discovery that both are colourless. For we can grant Mizrahi’s insistence that an object, to be coloured, must be visible, while denying that *only* what is coloured is visible. For it is intelligible that empty space could be visible – numerous theorists take this as a datum.⁶⁵ But this being so, we could equally suppose that transparent things *are* invisible, *not* because they are colourless, but because *when* they are invisible – i.e. glittering lines aside - we see the entirety of the region of space they occupy. Indeed this is compatible with what Mizrahi writes above, for she says “in order to see behind or through a body, there must be no visible obstacle”. But saying that there must be no visible obstacle – no thing – is not to say there must be nothing visible. For empty space may be visible.

Besides, the simple thought that empty space is invisible because it is colourless is not sufficiently convincing to trump phenomenology, however ambivalent. It is just not self-evident that we don’t see empty space because it is colourless. For imagine if empty space had been in some sense ‘coloured’ – rose-tinted say - perhaps we would then be inclined to allow that empty space is something we see. Yet if it were ubiquitously and uniformly rose-tinted, maybe we would fail to notice it, and even mistakenly suppose it invisible.

Or again, suppose that empty space in Twin Earth is ‘coloured’. A tourist from Earth might at once observe that she can now see empty space. But perhaps this experience would soon fade, a little like the adaption Ivo Köhler reported subjects to undergo when wearing two-toned goggles, one half of which was yellow and the other blue.

⁶⁵ For example, Richardson (2010, p. 228) writes “it seems rather obviously characteristic of vision that we not only see objects but also the empty space around and between them”.

After a while subjects no longer perceived, or perhaps noticed, the disruption to their colour experience.⁶⁶

Of course, we should be suspicious of claims that we have undergone some kind of colour adaption in the case of space – space, after all, is immaterial. But there is another sense in which empty space displays a ubiquity and uniformity that might go unnoticed.

The space that our visual system has evolved to represent is ubiquitously and uniformly Euclidean. Moreover, unlike objects, the space occupied by objects has no visible boundaries. This might lead one to suppose, mistakenly, that empty space has no shape. But Relativity speaks against this. Even Euclidean space has a shape - it is flat. So why should it be false that we directly and non-epistemically see the shape that the space in our vicinity has?

This is what the second account I detail urges. First, however, I assess a proposal that is, on the face of it, more modest.

2.

To begin, it is helpful to differentiate the spaces in which things are from the spaces which are in things. There are things in the room you now occupy – a chair, a reading lamp. And there are holes in things – proverbially, doughnuts and Polo mints. Call the former space mass-quantified space and the latter empty particulars.

There are a number of ways of distinguishing mass-quantified empty space and empty particulars. We can count empty particulars,⁶⁷ but not mass-quantified empty space. We can count the holes in a wedge of emmental or a pair of shoes, but although we

⁶⁶ See Ward (2011) for a more detailed description of this phenomenon.

⁶⁷ For an account of how see Casati and Varzi (2004).

can single out empty regions, by nodding at them say,⁶⁸ we can't count mass-quantified empty regions.

Second, empty particulars can be moved – the holes in doughnuts move with their so-called hosts, the material from which the 'dough'nut is made.⁶⁹ But mass-quantified empty space doesn't move. This, recall, was one of the features of our naïve conception of empty space that mark it out as absolute. As I explained in Chapter One, regions of space *have* particularity without *being* particulars – they have particularity in virtue of their place in the manifold. But in contrast empty particulars owe their particularity to their hosts. This explains why they can be located 'in' space and move through it – the hole in the shoe moves with its wearer.

Finally, unlike mass-quantified empty space, some empty particulars have descriptive names - tunnels, cavities, gaps. Some even have proper names; the Aitken Basin is the largest crater on the moon.

As I noted, I am primarily concerned with the perception of mass-quantified empty space in a ground sense, space that, in our sketch, would be figured by unmarked paper. On the first account I set out, however, perceiving such space is analogized to perceiving empty particulars; what is involved in perceiving the latter is a microcosm of what is involved in perceiving the former.

⁶⁸ Incidentally, the fact that we can indexically pick out or gesture at empty regions is, at least arguably, another reason that weighs in favour of absolutism. As Maudlin (1993, p. 191) writes: "For the substantialist, terms such as "here" or "now" can be used to drive linguistic pegs into the absolute fabric of space and time. Without such pegs, the static Leibniz shift cannot even be formulated. The relationist will no doubt contest this interpretation of the indexicals. If no substantial points are available to pick out, such terminology must be explicated instead in terms of relations to particular physical bodies. But to object this to the substantialist is a manifest *petito principii*: If such points do exist, there is no reason that we cannot directly refer to them...The world described by the shift may be qualitatively indistinguishable from the actual world in the sense that no purely qualitative predicate is true of the one which is false of the other. But we have more than purely qualitative vocabulary to describe the actual world; we have, for example, the indexicals without which the Leibniz static shift cannot be described".

⁶⁹ See Casati and Varzi (1994) for a more detailed explanation of this notion – viz. holes having 'hosts'.

There are two broad ways of accounting for empty particulars from an ontological perspective – one can be nominalist or realist about such particulars. Take the example of holes. A nominalist says that the name “hole” has no referent, while a realist naturally demurs.⁷⁰ Within the realist camp, however, there are *two* distinct positions: one can identify holes with their so-called hosts, or one can suppose that holes are something in addition to their hosts, although ontologically dependent on them. Call the first position Superficial Realism, and the latter Immaterial Realism. I aim to elucidate Superficial Realism, specifically as a way of shoring up a dialectic that can also be brought to bear, not on the ontology of mass-quantified space – we have, after all, assumed absolutism – but on how it is perceived.

Unlike the nominalist, the superficial realist supposes that in saying ‘there is a crack in the glass’, we quantify over real things. Unlike the immaterial realist however, the superficialist insists that we quantify, not over immaterial things, but material things with certain surface properties. For example, in speaking of a “tunnel”, we speak only of a certain way in which a mountain, say, is shaped. Likewise, in speaking of the “hole” in the Polo, we simply describe the sweet’s form. Such realism is materialist, and, as David and Stephanie Lewis demonstrate in their philosophical dialogue “Holes”, curiously so in the case of empty space:

Argle. When I say that there are holes in something, I mean nothing more nor less than it is perforated. The synonymous shape-predicates ‘..is perforated’ and ‘there are holes in...’ – just like any other shape predicate, say ‘...is a dodecahedron’ – may truly be predicated of pieces of cheese, without any implication that perforation is due to the presence of occult, immaterial entities. (1970, p. 206)

Bargle. ...You are thinking, doubtless, that every hole is filled with matter: silver amalgam, air, interstellar gas, luminiferous ether or whatever it may be....[but] how can something utterly devoid of matter be made of matter? (ibid., p. 207)

⁷⁰ Note that this debate is independent of the debate about the ontology of space, since one could be nominalist about empty particulars, and yet be realist about empty space (this seems to be the position of Simons 1997).

Argle. You are looking for the matter in the wrong place. (I mean to say, that's what you would be doing if there were any such things as places, which there aren't). The matter isn't inside the hole. It would be absurd to say it was: nobody wants to say that holes are inside themselves. The matter surrounds the hole. The lining of a hole, you agree is a material object. For every hole there is a hole-lining; for every hole-lining there is a hole. I say the hole-lining *is* the hole (ibid.).

As this excerpt dramatises, what motivates superficialism about holes is relationism about space (note the parenthesis – “I mean to say, that's what you would be doing if there were any such things as places, which there aren't”). But because the superficialist identifies holes with their so-called material linings, *realism* about holes can be advanced. Notably, then, this strategy is eliminativist, at least from the perspective of naïve ontology; holes are construed, counter-intuitively, as materially and spatially co-incident with the matter that surrounds them. But this makes it easy, or so it seems, to explain how holes can be perceived – namely by perceiving the hole-linings with which they are identified. As I explain, however, this ease is only superficial.

Peculiarly, holes can be made of different substances as a function of the hole-lining with which the hole is identified. But we would never say a hole was “made of cheese” or of leather or glass. Oddly too, the volume of the hole must be the same as its putative host. Yet surely we should want to say that the volume of the eye of a needle, say, is less than the volume of the needle itself; in Sanford's (1967) terms, we should want to say that the intensive volume is less than the extensive volume.⁷¹

Translated to the case of empty space, similar oddities arise. The space that separates my desk from the door is bordered on the right by bookshelves, and on the left by a window. So, on the understanding that this empty space is identified with the material that surrounds it, it is *constituted* by parts of the desk, as well as by the door and bookshelves. Moreover, since some of those objects ‘line’ other empty spaces, the question as to how we parse particular empty spaces arises, as well as the issue as to how we determine the volume of the relevant empty space. Does it have the same volume as the region that, as we would naively put it, *includes* those objects? Or is it

⁷¹ See Casati and Varzi (1994, pp. 25-26).

just the region we take, albeit mistakenly on this view, to be ‘outside’ their surfaces? And how can a hole be a property of an object that comprises these distinct things?⁷²

Given these difficulties, it is fortunate, then, that the thesis that empty space is perceived by seeing the surfaces of objects doesn’t rely on an identity thesis.⁷³ A theorist that advances a superficialist account of *perceiving* empty space may be an immaterial realist about the *ontology* of empty space; it may be granted that empty space is something distinct from the surfaces that articulate it. Bermudez (2000) is perhaps one such theorist. I requote:

“Holes are an intriguing case...There is an obvious sense in which holes cannot be perceived. If as is overwhelmingly plausible, perception involves a causal relation between perceiver and the object(s) of perception, then holes cannot count as objects of perception for the simple reason that they have no causal powers. Apparent cases of perception of holes will have to be parsed in such a way that holes no longer count as objects of perception. One might want to parse ‘x sees a hole’ as ‘x becomes aware of the presence of a hole in virtue of perceiving parts of the surface(s) of some material object or combination of material objects (hole-surrounds)’”. (2000, p. 367)

Here Bermudez does not explicitly endorse any particular position on the ontology of holes or, we might suppose, empty space. Still, since he makes the imperceptibility of holes spring from their inefficacy, not their non-existence, Immaterial Realism might be assumed, at least so far as their ontology is concerned. As such, the following extrapolation, concerning their perception, seems fair: ‘x sees some empty space’ can be parsed as ‘x becomes aware of the presence of empty space in virtue of perceiving parts of the surfaces of some material object or objects’. I suggest this extrapolation helps bring into focus the consequences of adopting a superficialist treatment of perceiving empty space. First, a note on Bermudez’s broader proposal is in order.

Bermudez argues that we perceive three-dimensional objects directly by perceiving their facing surfaces. As such, he recommends cleaving apart two notions that have been systematically run together in the philosophical literature on perception – direct

⁷² Thanks to Matt Nudds for this pointer.

⁷³ Casati and Varzi also make this point - see (ibid., p. 157).

and immediate perception. The former he takes to be epistemological, while the latter is supposed to capture a relation of objective dependence, typically spelt out in terms of an ‘in virtue of’ relation. This says: if x is seen ‘in virtue of’ y , y is immediately perceived and x is mediately perceived (and y is immediately seen if it is not seen in virtue of anything else).⁷⁴ In contrast, ‘direct’ perception is supposed to gesture at the kind of perceptual contact with an object that is often understood on the model of Russellian acquaintance, i.e. contact that must be enjoyed if one is to make demonstrative judgments about that thing. Bermudez invokes Paul Snowdon’s notion of d-perception as a way of making this plain. This says:

“ x d-perceives y iff x stands, in virtue of x ’s perceptual experience, in such a relation to y that, if x could make demonstrative judgments, then it would be possible for x to make the true demonstrative judgement ‘That is y ’”. (Snowdon 1992 p. 56)

And with these two distinguished, Bermudez reasons: it is not “obvious why one could not perceive an object in virtue of perceiving something else, and yet still be perceptually acquainted with it in a way that would allow one to identify it demonstratively.” (2000, p. 357). But what happens in the case of perceiving empty space?

In the passage above, Bermudez takes cases of the perception of holes to be only “apparent”. Holes, we are told, are inefficacious and hence can’t shore up in experience. But, as such, they can’t be immediately perceived. We do, however, have perceptual contact with the surfaces of objects. So perhaps we enjoy mediate perception of holes and, by extension, empty space, through the immediate perception of surfaces. By Bermudez’ lights, such perception would be *direct* if, on the basis of perceiving those surfaces, it would be possible to make true demonstrative judgments about the empty spaces they ‘line’. Unfortunately, however, he does not provide us with the conceptual materials to effect the “fine-tuning” he supposes his account requires in the case of holes and, as I suppose, empty space (ibid., p. 357). Perhaps, however, we can surmise on behalf of the superficialist.

⁷⁴ See also Jackson (1977, pp.15-16).

It might be thought that in perceiving the surfaces of objects, one is made aware of the failure to experience anything ‘outside’ those surfaces and, on the basis of this failure, that one comes to be in a representational state with the content ‘no thing is at that region’ (there being no thing at a region explaining one’s failure to experience anything there). Notably, such an account of perceiving empty space isn’t strictly speaking perceptual, since the presence of empty space is only inferred.⁷⁵

Importantly too, since the ‘no’ in this proposition is meant to pick out something like a negation operator, it requires that, for a subject to come to be aware of the presence of empty space in her surroundings, understood as space at which objects are absent, she must be able to enjoy mental states, not merely with material conceptual content, but *logical* conceptual content - content that has no material referent.⁷⁶ Indeed, it might even be wondered whether this makes tempting a category mistake, the fact that such content is formal, and so in a sense immaterial, leading to the assumption that the possession of mental states involving logical content is a condition on perceiving immaterial empty space.⁷⁷ If so, then, in line with Wittgenstein’s counsel, the following ‘reminders’ might be offered:

If seeing empty space and seeing *that* a space is empty are assimilated such that perception of the former involves the possession of mental states with logical conceptual content, then arguably infants and many animals should not be found to enjoy experiences of empty space.

Much more critical, however, is the following dilemma: Like empty space, the rear facing side of an object is also causally inefficacious with respect to the immediate content of perception. Nonetheless, Bermudez allows that three-dimensional objects can be directly perceived, and the (extrapolated) suggestion is that the same treatment can apply to empty space. But if empty space is to be directly perceived through the immediate perception of the surfaces of objects, then perhaps we should not attribute

⁷⁵ I offer a more sustained discussion of this view in Chapter Five.

⁷⁶ See John MacFarlane’s doctoral thesis for an account of diverse ways in which ‘form’, as opposed to ‘content’, can be understood; also, relatedly, the distinction between material and formal inference made by Brandom (1994, pp. 104-105).

⁷⁷ Cf. Sorensen’s entry on ‘Nothingness’ in the Stanford Encyclopedia. Sorensen reports that “since Heidegger thinks that animals do not experience nothingness, he is committed to skepticism about animal reasoning involving negation”.

to the superficialist a position on which the perception of empty space involves inference after all, since a subject that must infer the presence of something is not perceptually acquainted with it. But if the presence of empty space is not inferred, and it is inefficacious with respect to the immediate content of perception, how can it be directly perceived? It might be thought that the presence of the rear-facing sides of objects need not be inferred on the basis of the immediate perception of their facing surfaces, since objects, unlike space, *have* surfaces. But this does not explain how *empty space* can be directly perceived - *unless*, that is, the metaphysical identity thesis is also advanced (viz. where holes and empty spaces *are* their linings and 'empty spaces' thereby *have* surfaces). But such an identity saves direct perception only at the expense of making empty space material.

It might be objected, then, that it is only the distinction between direct and immediate perception that yields this conclusion. Why not allow that we *indirectly* perceive empty space by perceiving the facing surfaces of objects?

Above, I sketched one reason why: insisting that we *indirectly* perceive empty space by perceiving the facing surfaces of objects returns us to the proposal that perceiving empty space involves entertaining mental states with formal conceptual content. So perhaps we should seek out an alternative explanation. One alternative is to invoke an alternation:

It might be suggested that seeing surfaces involves not an *absence of experience*, but *experience of absence*. It involves experiencing *no thing* outwith the surfaces seen. Richardson (2010, p. 230) reifies this distinction:

"there is a difference...between absence of visual experience... and experience of 'nothing there' – of empty space. This is brought out by reflecting on what are, at least on the face of it, examples of localised absence of visual experience...When a bright light is flashed into your face, the retinal cells onto which the light is focussed are temporarily bleached. For a moment, the cells are, as Austin Clark puts it, 'out of commission'... At the location in space from which reflected light is focussed onto these cells, nothing, briefly, can be seen. As the cells recover, the experience is that which we characterise as an 'afterimage'. During that brief period

when the cells are out of commission, we have a temporary blindspot – a location at which there is an absence of visual experience.”

Even so, it might be thought that making this switch is not without consequences. I detail two.

First, given that absences are baffless, appealing to an experience of absence arguably requires embracing a controversial genuinist take on negative causation (see Chapter Two), at least assuming a Causal Theory of Perception is likewise embraced.⁷⁸

Second, if the perception of what is absent outwith the boundaries of objects is itself required to make sense of the perception of their surfaces,⁷⁹ then this may involve an inadvertent and unvirtuous appeal to empty space. For example, C. B. Martin writes:

“The concept of an edge is the concept of a limit of where something is and where something isn’t...The reference of the referring term ‘world’ is divided into presences whose limits are drawn by absence” (1996, p. 60).

But if what is required to perceive the edges or surfaces of material objects is the absence of material outwith those boundaries, then this just requires the perception of empty space. And if the perception of surfaces *itself* involves the perception of empty space, then, by appealing to surfaces, the superficialist appeals to the empty space that is supposed to be perceived in terms of them.

Given these difficulties, then, we should naturally seek to resist a superficialist treatment. For the moment, however, we might grant the following:

If perceiving the surfaces of objects involves seeing the absence of objects outwith those surfaces, then either this involves negative causation, which a superficialist might expressly wish to rule out, or it involves perceiving *regions at which there are no objects* – namely, empty space. But this is precisely what the superficialist wanted to reductively explain. If seeing surfaces involves seeing empty space, it might be thought that we cannot explain the seeing of empty space in terms of the immediate

⁷⁸ But see Chapter Five for an account of how the Structuralist View circumvents this difficulty.

⁷⁹ I owe this point to Soteriou (2011).

perception of surfaces. The superficialist view thereby collapses into the untutored position that it ideally sought to domesticate – the supposition that we see empty space. So how do we make sense of this, if not entirely superficially?

I have already glossed an account on which the presence of empty space is inferred and so is not strictly speaking seen - on such a view the 'perception' of empty space is indirect (call perception that is indirect 'perception'). In Chapter Five, I consider Soteriou's (2011) position, one to which the epithet 'indirect' cannot be so happily applied, but which nonetheless shares with the indirect appeal to logical formal content an emphasis on *experience*, and specifically its structural features (see also Richardson (2010)). In contrast, the view I now explore and defend explains the perception of empty space not in terms of experience, but in terms of its *nature*. This view, then, is a direct account insofar as it insists that empty space has visible properties that are directly perceived. Here I focus on the visual case, while Chapter Six touches on the tactile.

4.

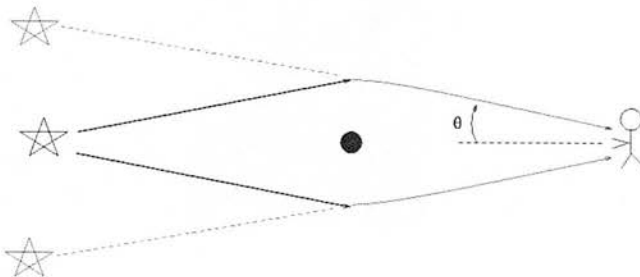
In *The Shape of Space*, Nerlich develops an argument that has been so far overlooked in the philosophy of perception. He argues that non-Euclidean regions of empty space can be seen:

"Let's suppose that, nearby in an otherwise flat space, there is a football-sized volume within which the curvature sharply varies. (All you need to grasp in order to follow the examples is that light lines will have no parallel paths to follow through regions which aren't Euclidean). It will be a non-Euclidean hole. Since the curvature is zero everywhere round this hole but not zero inside it, it has to contain both positively and negatively curved regions. Linear paths which are parallel outside the hole converge and diverge again inside it (depending on just what kind of hole it is). So, as we look at distant things that lie beyond the hole, the photons by means of which we see them sometimes pass through the hole and sometimes not; things will change their appearances as the visual angles subtended by the various paths change, just as things change their shapes and shimmer in a heat haze or when seen through some inhomogeneous physical medium like uneven glass." (1994, p. 38)

Nerlich's thought is that were we in a position to see it, empty space, as a function of its shape, would alter how a background source appears. Here "in a position" might be thought to encompass a variety of necessary conditions; those whereby the perceiver's perceptual apparatus is normal, where he or she is in the space perceived with his or her eyes open, where there is light, and finally, where the relevant region falls within his or her field of vision. These positions being satisfied - which is to say the perceiver is able in the sense of being *capable* of seeing empty space - the idea is as follows:

If the appearance of something seen through an empty region is distorted relative to its appearance when seen through Euclidean space, then the region seen through is *itself* seen. The idea is that because you see the distortion, *you see the space*. Think of how a magnifying glass changes how things look. The parallel thought is that space can likewise act like a lens.⁸⁰ For example, in spacetime with Riemannian curvature, light from a background source would converge, as it would in a convex lens. But in a Lobachevskian spacetime, it would rather act as a concave lens; light would de-focus in passing through it, with consequences for how things seen through it would look. Unlike a lens though, which can be moved *through* space, the lensing region, in being

⁸⁰ See Schneider *et al* 1999 for an account of gravitational lensing. In the presence of mass with a large gravitational pull - nebulae say - light bends, occasionally yielding some peculiar observational effects. For example, depending on the location of the intervening mass, multiple images of the source can appear. The diagram* below shows a straightforward example of such lensing - light from the source is deflected due to the presence of some intervening material. The most well known example of such lensing is the Twin Quasar. Due to a large concentration of matter between the quasar and earth, not one, but *two* images of the quasar appear in the night sky (QSO 0957+561 **A** and QSO 0957+561 **B**).



Gravitational lensing - an intervening mass causes light to bend.

The idea in the passage above is that empty space should likewise be thought capable of acting like a lens; depending on its shape, how a background source appears should be found to vary. I am grateful to Alasdair Richmond for the suggestion that Nerlich's idea effectively treats empty space as a gravitational lens.

*Image created by Michael Richmond. <<http://spiff.rit.edu/classes/phys440/lectures/limb/limb.html>>. Retrieved 26/08/11,

made of space, cannot move. Still, so long as it were surrounded by near Euclidean space, a *perceiver* would be able to move around it and so get a sense of its size and relative location: “we would see that the distorting region lies now in this direction from us, and now in that, and we would soon see how distant it was and how big” (ibid., p. 39). In such cases, Nerlich petitions, wouldn’t we say “not that we see *that* there is such a hole, but that *we see the hole itself*” (ibid.)?

Here a comparison with fairground mirrors comes to mind. Mirrors that are planar preserve the geometric properties of the entities that they reflect. But when the surface is curved, the image is distorted - the angle of incidence is no longer equal to the angle of reflection. An explicit specular example helps clarify this analogy, one that also helps paint a picture of what Nerlich’s imaginative landscape would look like (albeit by using computer generated ‘mirrors’, not regions of empty space).



A mirrored sphere is gradually elongated into an egg shape. Where the curvature along the vertical axis is reduced, the reflected scene is ‘stretched’ (Fleming, Torralba and Adelson 2004, p. 805).

In these images, starting from the top, a curved mirrored surface is repeatedly elongated, with consequences for the specular image presented. In the first picture, the

curvature is uniform, and so is the image distortion. But consider the third picture. The surface of the mirror is no longer uniformly curved but is egg-shaped, something which the properties of the specular image encode; where the surface is highly curved – at the top and bottom of the ‘egg’ - more information is compressed into a smaller portion of the image, and where it is less curved the image is ‘stretched’. The authors argue that such distortion is exploited by the visual system to retrieve information about the three-dimensional shape of the reflecting thing. I suggest that Nerlich’s idea is the same. Just as reflections on teaspoons and taps reveal something about their morphology, how things appear to look when seen through an empty region says something about the shape of the region seen through. This however does not exhaust Nerlich’s proposal.

In addition to this thought, Nerlich implicitly adds another, one he does not argue for, but which he might be assumed to endorse; namely the thought that the region seen through is visible only if it is visually differentiated from the regions in which it is embedded. I spell out the import of this claim, before renegotiating it in §5.

Fred Dretske has forcefully argued that a condition on seeing is visual differentiation. When something is visually differentiated, in addition to it looking some way to a perceiver, it looks *distinct* from its immediate environment. For example:

“Suppose that we attach a piece of beige paper to a beige wall and dim the lights until the paper appears (from where we are standing) as an undistinguished portion of the wall. Does one, under these circumstances, still *see* the piece of paper?” (1969, p. 23)

Dretske says ‘no’, and intuitively I think that phenomenology concurs – when we are happy to say that a subject has seen something, independently of whatever beliefs the subject has about that thing, we suppose that the thing seen is differentiated from its immediate surroundings. How does the visual differentiation condition play out on Nerlich’s account?

Imagine there were non-Euclidean regions a bit like the mirrored balls above sprinkled across our solar system. And suppose too that such curved regions were interspersed with intervening flat spaces. Nerlich wonders: “might we not come to say

that we see places quite generally?" (1994, p. 39). Here his idea is that in such a landscape flat regions would be seen *in relation* to curved regions, while curved regions would presumably be seen because they are so interspersed. Hence, regions of both species would be seen because they are visually differentiated from each other. But if flat regions are seen only in relation to curved regions, we might ask: what happens to space in our vicinity, which is *uniformly* flat? Since it is homogeneous, is the visual differentiation condition thereby flouted and empty space invisible? So it seems. For although, as Nerlich assures us, space has, "essentially visual properties" (ibid., p. 39), these he insists are "visually distorting ones". Hence, we only see regions that visually distort. And this leads him to conclude: "our space is imperceptible in the same way as clear air in a jar is" and, like the Emperor's new clothes, "we know where to look and feel to see *that* it's invisible" (ibid., p. 40).

The idea, then, is that one sees *that* empty space in our vicinity is invisible because, like the Emperor's new clothes, one sees that nothing is there. But this suggests that unlike the seeing of the non-Euclidean hole which, recall, *is itself seen*, seeing uniformly Euclidean empty space is indirect. One sees only *that* no object is at some place *which one thereby doesn't see* – it is invisible because no object is located there. For Nerlich, then, it is the *geometric* and not *ontic* kind of space that makes it elusive to perception; the shape of space is what renders it perceptible or, in the case of the space we are in, invisible.

In the next section, I argue against Nerlich's pessimism about the visibility of the space in our vicinity and I suggest that we can harness the very insight he impresses in the non-Euclidean case.

If space has essentially visual properties that, as he argues, flow from its shape, why should only the regions that are deemed visible be those that distort? Moreover, even if, like Dretske's wall, regions of Euclidean space are not visually differentiated *from each other*, why not allow that regions of empty space *are* visually differentiated, namely from the opaque objects whose 'outside' or ground they are?

In trying to characterize the perceptual character that experience of such non-Euclidean regions would yield, notice that Nerlich draws a series of implicit comparative claims. We are told that things seen through such regions would change their appearance “just as things change their shapes and shimmer in a heat haze” or “when seen through some inhomogeneous physical medium like uneven glass” (ibid. p. 38). Such analogies are useful in trying to rally an understanding of how something of which we have no perceptual experience would look – viz. the appearance of an object seen through non-Euclidean empty space – and they work by drawing parallels with paradigmatic visual experiences that we *do* have.

We have experience of seeing through haze on a hot summer’s day, or the print of a tablecloth distorted by bubbles in a glass. Yet while such claims are *comparative*, we are in no position to evaluate the *comparison they make* since we do not have experience of the regions of empty space they aim to comparatively pick out. But this is not true of the space we are in.

I aim to show that we can excavate ways in which empty space in our vicinity looks by appeal to comparative looks claims. What’s more, unlike claims made in respect of non-Euclidean regions, I suggest we can actually evaluate the comparisons they make because we have acquaintance with the visible properties that warrant the making of such claims in the first place – I argue below that empty space in our vicinity looks ‘clear’ and ‘see-through’.

Still, it might be wondered whether the argument I offer doesn’t beg the question – how can something that is invisible look a certain way? I propose, however, that the intelligibility of such looks statements, and, more importantly, *the fact that they can be evaluated*, entails perceptual acquaintance with how empty space looks. As Chisholm writes, whose discussion of appearance verbs is the starting point for much philosophical theorizing on looks:

“If you knew nothing of Arabian music, you could never tell, merely by listening to someone play, whether or not his music happens to “sound Arabian” (1957, p. 49).

But likewise, as I aim to show, if you had never seen empty space, you wouldn’t be able to tell, just by looking, whether it looks, as I will argue, ‘clear’ or ‘see-through’. Indeed, the fact that we can evaluate claims about the look of empty space might even be taken as transcendental evidence for our perceptual acquaintance with the way of looking that empty space has.⁸¹

To begin, I say something about looks claims.

Sometimes when we say that something looks a certain way, we want to suggest that there is *visual evidence* for the thing looking that way without yet claiming that things *are* the way they look. So, on seeing the curtains drawn in the house next door, a neighbour might say: “it looks like they’re away”, without intending to assert that the occupants *are* away for the neighbour may not know. On other occasions, though, when we say that something looks a certain way, we don’t even aim to gesture at visual evidence for the thing being the way it looks. In a recent paper, M. G. F. Martin offers an iconic example:



(1) That model looks pregnant

When (1) is said of the model in the picture, it is not meant to be understood *evidentially*; in saying (1) the speaker doesn’t intend to point to visual evidence for

⁸¹ A parallel might be as follows. Molecules are invisible but we know they are among the sorts of things that could be seen. If seen under a microscope, a given molecule might, for example, be said to look a bit like a crown. But we would never be able to say of numbers, which are also invisible, what way they would look if only we could see them. The claim that they would look a certain way, if only we could see them, is *unintelligible* (supposing it is genuinely numbers under discussion and not representations of them).

the model *being* pregnant. The use of looks, then, is non-evidential. It means only to pick out some *way of looking* that the model has. I suggest that we can describe the way empty space looks in such non-evidential terms.

For example, in describing how non-Euclidean holes would look when seen through, Nerlich draws on paradigmatic cases of perceptual experience, those where the medium seen through - haze or inhomogeneous glass - modifies the appearance of objects seen through it (recall, his thought was that the medium seen through is *itself* rendered visible because of the distortion it causes). But saying that empty regions can look some way - for example, 'hazy' or 'shimmery' or 'like fairground mirrors' - is not yet to say that there is visual evidence for the region *being* that way. For example, in saying a region looks 'misty', this need not be taken as a claim that the region *is* misty, unless by that one means to say that the region is *occupied* by mist. For what would it *mean* to say that space is misty, space being immaterial? Still, in the context of Nerlich's thought experiment, such statements - viz. that a region looks 'hazy' or 'shimmery' - *are* intelligible. I suggest that this, in itself, is noteworthy.

The fact that such statements are intelligible suggests that it is anyway implicit that empty regions *can* have ways of looking that warrant the application of such claims - viz. that they 'look *F*'. For if the relevant hypothetical regions could not even be *conceived* of looking some way, the claim that they would look some way would be unintelligible.

Still, even if such statements are intelligible, it remains the case that, despite their intelligibility, we are not yet in a position to evaluate the comparisons they make since we have no perceptual experience of the non-Euclidean regions they aim to pick out. But consider such claims when made of the space we are in.

We might evaluate as *false* claims that the empty regions of space we see through distort the appearance of objects seen through it.⁸² Unwittingly, then, we would implicitly grant as true claims that the space in our vicinity does *not* distort the look of

⁸² Of course, outside of the context of a philosophical argument we would hardly know what such a statement means. The idea is that, granting Nerlich's insight, we would evaluate as false claims that the empty regions of space we see through distort the appearance of objects seen through them (viz. in the manner of a magnifying glass).

things. Of course, we have some way to go to the claim that empty space is seen. So consider what I am calling a Nerlich landscape – a region where curved and flat regions are interspersed.

It might be said that such a landscape if seen from afar would look a little like a piece of inhomogeneous glass looks – viz. in which ‘clear’ regions are separated by bubbles.⁸³ But if so, it might conversely be allowed that space in our vicinity does *not* look like this. Rather it looks entirely ‘clear’; it has the appearance that clear glass does, at least with respect to its homogeneity, an appearance that arises from its shape – it is nearly Euclidean, and uniformly so. But as such, not only does empty space in our vicinity *not* look like a Nerlich landscape would – with *local* regions that are topologically convoluted – it is *globally* topologically uniform. That is to say, it is not merely the case that adjacent regions are homogenous with respect to their appearance, but that *all* empty regions look the same. I spell out this thought.

Imagine a phenomenal sorites paradox arising for adjacent regions of empty space. Regions *a* and *b* might be judged to distort the appearance of items seen through them to the same degree. Likewise, *b* and *c*. But region *c* might be judged to distort the appearance of items seen through it more or less than region *a*. The claim is that empty space in our vicinity is not like this. It is locally and globally homogenous in respect of its shape – it is homogeneously flat. My claim is not just that this has consequences for how it looks (after all, Dretske’s beige piece of paper has a way of looking), but *that empty space is seen*. I defend this additional claim below. First, I elaborate a little further on the look of empty space.

Above, I tried to uncover an assumption operative on Nerlich’s account: the thought that homogeneously Euclidean regions are invisible because they are visually undifferentiated from each other. This assumption can be put somewhat differently. For any item *x*, if *x* was seen through such regions it would look the same. In contrast,

⁸³ Assume the glass, the appearance of which is being used to comparatively pick out the look of empty space, is coloured. This is to distinguish two species of clarity. In trying to isolate the clearness of empty space in our vicinity, we need only have in mind the clarity of *homogenous* glass; glass that is not smeared, or scratched or that contains air-bubbles. Such glass may be tinted. Of course, empty space is also clear in the sense that it is *colourless*, but this is not the kind of clarity I aim to isolate above. The apparent colourlessness of empty space is better captured by the notion of it looking see-through, a notion that I spell out below.

for any two regions that differ in their intrinsic curvature, the appearance of x would, with respect to one and not the other, appear distorted. This has been our narrative so far. There is, however, something further to note that is implicit in the idiom of appearances and distortion, namely the thought that some *thing* must be seen through the relevant region, for otherwise how would the relevant ‘distortion’ be indexed or noticed? But this in turn suggests a distinction.

For a region to be seen, it is not merely sufficient that it be *lit*, the presence of light naturally being a condition on *anything* being seen. Rather, what light there is, and there may be very little (for example, there may only be a lone star), must *illuminate* – that is, it must fall on something.

In *The World of Colour*, David Katz illustrates the distinction between luminosity and illumination:

“If on a dark night we sally forth into the open with a red lantern, and hold this lantern above us in the direction of the open sky, we will then see a beautiful luminous red circle and around it pitch blackness. In such a case we need see no illumination, and there is none to see as long as the lantern does not by chance illumine some previously unseen objects”. (1935, p. 39)

This distinction seems to me important. Nerlich’s argument appeals to the idea of *distortion* – it says that where regions seen through cause no distortion, those regions are invisible.⁸⁴ I propose, however, that it is plausible that such regions *are* seen, but are not noticed precisely *because* they do not visually distort. Nonetheless, it is only on the assumption that something is seen through the region that we can make sense of the claim that the visible properties of empty space *can be seen*.

Above I noted Dretske’s insistence that when something is visually differentiated, in addition to it looking some way to a percipient, it also looks *distinct* from its

⁸⁴ Cf. Heider (1926, p. 1): “We see things that are in immediate contact with our skins and we are often aware of one thing through something else. For instance, we see stars through empty space; we hear the sound of a bell through the air; we measure the pressure of air by means of a barometer; a person’s expressive movements tell us something of what he is etc. These cases are not entirely equivalent, but what they do have in common is that the object of perception or cognition does not affect the sense organ directly but by means of some kind of mediation”.

immediate environment. I also tried to make sense of the notion of empty space in our vicinity looking some way by appeal to comparatives - I proposed that it looks 'clear' and I suggested that its so looking flows from its shape. Still, on Dretske's understanding, looking some way to a percipient is not yet sufficient for being seen.

Consider his example. The beige paper looking some way (viz. beige) is not sufficient for it to be seen. To be seen it must be differentiated from the wall – it must stand out. Put somewhat differently, the wall must act as a ground. But if having a ground is an additional condition on being seen – viz. as well as looking some way - then perhaps Nerlich *would* after all grant that empty space in our vicinity has a way of looking, but that it remains unseen in not 'standing out' from other regions of empty space. On this understanding, it would be granted that empty space has a way of looking but that it remains unseen since, like the beige paper, it remains undifferentiated from adjacent empty regions. But surely this concession neglects the very material in terms of which Nerlich's thought experiment garners its force – the items whose characteristic appearance alters as a function of the curvature of the region through which they are seen. For even if it is insisted that adjacent regions of Euclidean empty space are not differentiated *with respect to each other*, it remains the case that, for Nerlich's thought experiment to make sense, the kind of visual appearance that regions of empty space can *in principle* have is not the kind of appearance that is characteristic of the look of coloured objects. For if empty space were to have an appearance characteristic of the look of objects, then, one would not be able to visually distinguish opaque objects from the regions through which they are seen. But this suggests an alternative differentiation condition, one that Nerlich's experiment requires and which is critically met even in the Euclidean case – empty regions are differentiated from the opaque objects the 'outside' of which they are. Material objects are, perversely, *its* ground.

Consider this in the context of the analogy we have been impressing: when an object is erased from a pencil sketch, what is left is a blank space – a white expanse - that is itself seen. Likewise, I am suggesting that when absolute space is 'cleared' of visible

objects, it is itself seen, so long as they, *qua its* ground, are also seen.⁸⁵ Call the look that empty space thereby has ‘see-through’.

Regions and entities that are see-through disclose the appearance of the object seen through them (even while, as have noted, in some instances they may distort the appearance of that object). As such, however, see-through regions and entities are not opaque. In saying that empty space looks ‘see-through’, then, I mean to gesture at its *non-opacity*, an appearance also shared by, among other things, water, mist (assuming it is translucent) and certain kinds of fabric - indeed, the compound adjective ‘see-through’ first appears in the 1950s in a headline in the american magazine *Life*. “See-through Fabrics Bring Undercoverings to the Surface”.⁸⁶

I henceforth use the adjective ‘see-through’ as an abbreviated way of picking out the appearance that empty space has, remembering of course that empty space in our vicinity is, in addition, ‘clear’.⁸⁷ Importantly, however, such terms are comparative and are used non-evidentially. That is to say, I don’t mean to gesture at visual evidence for empty space being ‘clear’ and ‘see-through’. I merely suggest that empty space looks that way.

In the closing section, I ask what properties or states of affairs warrant the making of such peculiar looks statements in the first place.

⁸⁵ The verb ‘to clear’ also means ‘to empty’ – something that the title of the chapter gestures at. It is noteworthy then that the verb ‘to clear’ undergoes patient/location alternation; a region can be cleared *of* something, or things can be cleared *from a place*.

⁸⁶ Curiously, by the 1970s such garments have achieved nominal status – they are See-Thrus.

⁸⁷ Notably, so long as non-Euclidean regions are seen through, they also have a ‘see-through’ look. Thanks to Sue Locke for pressing this point.

In a recent paper, M. G. F. Martin argues that the visible properties of objects, or as I would like to say, individuals are those that warrant the application of looks statements.⁸⁸ He offers the following narrative by way of explication:

Typically we can tell just by looking whether there are tomatoes, say, at the greengrocer. But consider a community that developed in a world equally full of tomatoes and schmatos – fruit that are identical in appearance to tomatoes but different in taste and “culinary application”. A shopper in such a world would not be able to tell, just by looking, whether there are tomatoes, and not schmatos, on the greengrocer’s stall. But this reveals that the property of looking like a tomato and being a tomato are distinct; a schmato has the former but not the latter. Moreover, returning to our world, there can be tomatoes that fail to have the canonical look of tomatoes while being tomatoes.

Now, since tomatoes and schmatos can’t be discriminated from each other on visual grounds, Martin calls them *visual duplicates*. Still, they are *visually non-unique* in the following sense: A kind is visually non-unique where there is a concrete individual which is a member of that kind and which has the look characteristic of the kind, but which also has a visual duplicate which is not a member of that kind. As such, the look of tomatoes is visually non-unique in the schmato world; there are schmatos that have the look. So can non-visually unique properties be candidates for constituting the look of an object?

Martin says ‘no’. If a non-visually unique property is had by an individual that has the look characteristic of that kind, and a visual duplicate also has the look but lacks the relevant property, then it can’t be the case that the property in question constitutes the look. We can cast this same thought a little differently. If for some property, *p*, one can affect a change in the property *but without a concomitant change in how things look*, then that property is not constitutive of the look of the individual that has that

⁸⁸ See Chapter One for an explanation of how the term ‘individuals’ can happily apply to regions of empty space. Since Absolutism is assumed, empty regions have particularity, in being part of a manifold, without being particulars.

property. For example, if a fairy Godmother transformed all schmatoes into tomatoes, we would not be able to tell just by looking. So the property of being a schmato is not constitutive of the look that schmatoes have. This, then, suggests a diagnostic. We may ask: which properties if transformed or substituted would result in a concomitant change in how things look? Martin suggests that observational properties would – those of colour and visible shape – and this is because observational properties are *visually unique*.

“That is to say, observational properties are those properties for which necessarily no object which exemplifies them, and is characteristic with respect to look for that property, has a visual duplicate” (2010, p. 203).

But this being the case there can be no distinction between having the look of that property and having that property; they must coincide.

This suggests the following definition:

Def(looks-CON) Those properties that constitute the look of an object or individual are those which, if they were modified, or substituted would result in a change in the look of that object or individual.

We can harness this definition as a way of responding to the question above, the question as to what properties or states of affairs warrant the making of claims to the effect that empty space looks a certain way – viz. ‘see-through’ and ‘clear’.

I have claimed that regions of space look ‘see-through’ in contrast to regions at which opaque objects are located. As such, space looking ‘see-through’ is dependent on the presence of an object (seen through the relevant region) and of light, both conditions thereby bringing about the “remarkable phenomenon” that David Katz remarks upon below – lit regions may look more or less bright:

“Let us look through the unlighted interior of a blackened tube, set up in a normally illuminated room in such a way that there is a space between the end of the tube and the farther wall of the room. We then see the space in front of the tube and beyond it in its normal brightness, but the space within the tube appears as clear – one is

tempted to say luminous – darkness. This darkness has nothing in common with the misty darkness of a fog, nor even with the dull darkness of the shadowed corner of a room. No sharp line can be drawn, it is true, between differently lighted spaces, but there always remains that remarkable phenomenon of empty spaces, lying one behind another, with clearly distinguishable, one might almost say, mutually contrasting brightnesses”. (1935, pp. 43-44)

Empty space, then, like objects, can look more or less bright as a function of the level of illumination. Still, how empty space *itself* looks does not change depending on how it is lit (anymore than a red kettle changes its colour in near darkness) – space in our vicinity always looks ‘clear’. What properties make it look that way?

If we accept the conclusion of Nerlich’s argument, then we should allow that a change in the intrinsic curvature of empty space would lead to a change in the way it looks as a function of how objects seen through it would look.⁸⁹ But by *Def* (looks-CON), we should thereby grant that the curvature of a region *constitutes* its look precisely because a change in the intrinsic curvature of a region results in a change in its look (again on the assumption that objects are seen through it). But, *pace* Nerlich, this result generalises to Euclidean regions: If we are compelled by Nerlich’s argument we should likewise grant that locally curved regions would change their appearance if they were ‘flattened’. Equivalently, if a given Nerlich landscape were ‘ironed out’, we should allow that its appearance would also change – as I am urging it would look ‘clear’. But since all these changes flow from the shape of space, the shape of space is constitutive of its look, *even when it is flat*.

We are now in a position to set out what properties or states of affairs warrant the making of such claims in the first place.

The state of affairs that warrants the claim that empty space looks ‘see-through’ involves the visual presentation of an object in a space through which the subject is path-connected to that object - I detail this notion a little further in Chapters Four and Seven. In contrast, what warrants the claim that empty space looks ‘clear’ is, if the argument advanced here is correct, the Euclidean shape of absolute space. As such,

⁸⁹ Presuming, that is, that the change in the degree of curvature is significant enough – I leave this issue aside.

we can evaluate such comparatives because we have acquaintance with, in the first instance, the complex state of affairs that involves the percipient, the object and the region through which it is seen, and in the second, the visible properties of empty space – its shape.

But this explains finally why such claims are both intelligible, and why they can be evaluated. They can be evaluated because we see empty space. So why was this ‘reminder’ so hard to come by?

I suggest two, related reasons:

First, because empty regions are homogeneous with respect to each other – they are ‘clear’. This means that we are apt to overlook the look of empty space. And second, because empty space has a ‘see-through’ look and typically we take see-through *things* to be invisible because they are transparent. Neither reason, however, entails that empty space is invisible.

7.

I have presented an argument for the visibility of empty space, and I have tried to bring its peculiar look into view by appeal to comparative looks statements. I have argued that empty space looks ‘see-through’ and ‘clear’, and I have urged that the intelligibility of these statements might be counted as transcendental evidence for our acquaintance with the look, itself explained by the intrinsic properties of the Euclidean space in our vicinity (presuming too that objects are present and illuminated). In Chapter Five, I consider another way of making sense of the claim that we see empty space – the Structural View.

I close by addressing some objections.

1. Objection from Dust

It might be objected that empty space in our world is not empty since it is filled with air and dust.

Response: Perceptually speaking, being filled or empty of air makes no discernable difference to how the space it occupies looks since air is effectively transparent and dust is too tiny to be seen. Besides, it is not simply the presence or absence of air, or indeed of any other invisible or visible object, that explains the look of space. As I argued, we explain the look of empty space by appeal too to its intrinsic shape.

2. *Objection from Water*

Regions of space filled with water are full, but they look see-through.⁹⁰ So it can't be the case that all regions of space that look see-through are empty. On the other hand, we do occasionally treat regions filled with water as empty – for example, scuba-divers are likely to treat the space they swim through as empty relative to those that are filled with fauna.

Response: It need not be denied that regions that are comparatively “full”, in one sense can't be relatively “empty” in another – recall the public bath at Oderberger Strasse. I am mostly interested, however, in empty regions in a *ground* sense, where these, I suggest, should be individuated *in terms of their having the look*. Besides, I don't claim that *all* regions that look see-through are empty. Regions filled with transparent objects may look empty if one can see the entirety of the region of space they occupy⁹¹ – this explains why one can mistakenly walk into a perfectly clean window the boundaries of which are invisible (i.e. glittering lines aside). You walk into the window because you don't see it – it's invisible. Rather, the region has the look *that empty regions have*.

3. *Objection from Clear Blue Sky*

When we see the sky, we can see empty space though without necessarily anything seeing through it, say if it is clear and cloudless.

Response: It is true in such instances that one sees empty space, but, perhaps surprisingly, if what I am arguing is correct, the sky doesn't look empty. One only

⁹⁰ Cf. Merleau Ponty (1968, xlvii-iii): “When through the water's thickness I see the tiling at the bottom of a pool, I do not see it *despite* the water and the reflections there; I see it through them and because of them.”

⁹¹ This way of putting things was suggested to me by Matt Nudds.

knows that it is empty because it is seen as continuous with the see-through space which one does see. I pick up this argument in Chapter Seven.

4. *Objection from Protean Objects*

Suppose we can magically modify the shape of space so as to practically bring about two phenomenally indistinguishable circumstances: one in which a *non-Euclidean object* is seen through a Euclidean region, and another in which a *Euclidean object* is seen through a non-Euclidean region. In such instances, one wouldn't be able to tell, *which* region one was in.

Response: Even if one can't tell which kind of region one is in, this doesn't undermine the thought that the shape of space is what renders it visible. Granted, like schmatoes and tomatoes, one wouldn't be able tell in such cases if one is in a Euclidean or a non-Euclidean region, but it is not true that there is no look that one sees, even if, on occasion one might be mistaken as to which.

5. *Objection from Efficacy*

It might be thought that empty space simply can't be seen since it is causally inefficacious. Here a metaphysical assumption, which I anyway disputed in Chapter Two, is supposed to trump phenomenology (however ambivalent).

Response: I have tried to rally transcendental evidence for our acquaintance with the look. As I argued, since the comparative looks claims I spelt out are intelligible and evaluable, one must have perceptual knowledge of what look is being specified.

6. *Objection from Spatial Relations*

One might deny that empty space is seen and that only spatial relations are.

Response: Though I have adopted absolutism as an assumption of this thesis, we can nonetheless respond to this theorist on his or her own terms. Such a theorist would naturally have to explain how spatial relations can be visible. Here the difficulty is that *relata* must begin and end somewhere, and seeing the boundaries of objects involves seeing whatever is 'outside' them, canonically empty space. But a relationist

who insists that spatial relations are visible can have no recourse to empty space. Whatever it is that is 'outside' objects is just whatever connects them, namely spatial relations. The relevant relation, then, must have some phenomenal character. But if this is not the character that flows from being made of empty space, then what?

7. *Objection from Magnification*

Dretske insists, somewhat peculiarly, that the ability to visually differentiate an object from its immediate surroundings "is a capacity which may be enhanced by the acquisition of eyeglasses" (1969, p. 28). But how does this translate to the case of space? It does not seem as though we can see space better through wearing spectacles.

Response: Since the ability to differentiate an object from its immediate surroundings is enhanced by wearing glasses, we should likewise grant, however oddly, that the ability to differentiate empty space from the objects for which it is their 'outside' is also augmented. For when one sees where an object begins and ends more clearly, one concomitantly sees where the empty space that is the 'outside' for the object begins and ends too. As I will later explain, in Chapter Eight, empty space and objects are *co-seen*.

8. *Objection from the Imperative*

Finally, it might be supposed that whatever is seen can form the subject of an imperative to 'look at x !' But we never entreat people to look at regions of empty space.

Response: Though we never entreat people to look at regions of empty space, there is no reason to suppose that the imperative is nonsensical. In most conversational contexts, the request *is* irrelevant, and the standard Gricean maxims are flouted. But I have tried to excavate the look *philosophically*, and the result, it seems to me, is not entirely uninformative.

At the outset I noted that phenomenology is not, after all, so reliable in the case of empty space, and I tried to provide a philosophical argument for our seeing empty

space, here drawing on Nerlich. There is some precedent for such a strategy; O'Shaughnessy uses it in *Consciousness and the World*. In trying to uncover the sense-data that, as he sees it, mediate perception of physical objects, he writes:

"It seems to me that we must avail ourselves instead of tools of an altogether different and non-observational kind: namely, those of argument. Indeed of argument of a purely philosophical order".
(2000, p. 439)

This has been my strategy too. But to this extent, my conclusion, which is a conclusion about our perceptual experience and its character, is not metaphysically neutral; it is premised on the adoption of absolutism as an assumption. Yet to that end, it is interesting to note that the argument from perception that *Nerlich* raises, and which I have harnessed (in spirit, if not to the letter), is in fact used to justify Absolutism, for with it he aims to disable one of the primary motivations for Relationism; the thought that empty space is imperceptible. He shows that, rather than putative imperceptibility of empty space making Relationism plausible, it makes Absolutism likely, since it is only through being Euclidean, and homogeneously so, that we fail to see it. *Pace Nerlich*, however, I have tried to urge, arguing from the intelligibility of comparative looks claims, that Euclidean space *is* perceived, but its look goes unnoticed or overlooked precisely because it is 'clear' and 'see-through'.

in nuce:

In this chapter, I have constructed an argument on which empty space has visible properties that are directly perceived – such properties flow from its shape. I have argued that even Euclidean space can be seen, despite looking 'clear' and 'see-through'. Call this account the Direct View.

Gaps, Traps and Paths

see through --

1. *lit.* To see objects on the other side of (an aperture, or something transparent).
Hence *fig.* to penetrate (a disguise, fallacious appearance), to detect (an imposture),
to perceive the real character or aims of (a person).

- *The Oxford English Dictionary*

In the last chapter, I outlined a position, drawing on Nerlich, on which empty space is directly perceived. But I also noted Bermudez's worry that since holes are inefficacious they can't shore up in perceptual experience. In Chapter Two, I argued against the metaphysical supposition which informs this assumption – the thought that space is inefficacious. Insofar as empty space is apt to affect its occupants, space might be thought to have structural biff. Still, Bermudez gestures at a genuine puzzle in the case of empty space.

We tend to think that our perception of things 'depends' on those things, something that Strawson forcefully argues for in his classic paper "Perception and its Objects". This is relatively easy to make sense of in the standard case he treats - the perception of *objects*. For example, we might think that our experience of objects appearing a certain way – looking a certain colour or feeling a certain way – depends on what properties those objects have. Likewise, we tend to think that *which* objects we see are those on which our experience depends, something that Grice (1961) excavates. But the case of perceiving empty space doesn't easily fit this model. It is not so easy to make sense of our perception of a given empty region depending on that region, and this is because, as I explained in the last chapter, it is not intuitively obvious that we *do* see empty space - recall that I had to appeal to philosophical argument to cajole a 'reminder'. Moreover, the question as to which empty space is seen seems to make little sense. Because regions are homogeneous, there is no question of reidentifying certain regions. And since regions cannot 'leap over each other', anymore than days of the week can, there is never any requirement to sort among numerically distinct

regions. So in what sense, if any, does the seeing of empty space ‘depend’ on its object? This question takes up the main body of the chapter.

Here’s a sketch of the response I aim to develop and defend:

I argue that *which* region one sees is the region that transmitted the light in terms of which one’s occurrent perceptual experience of *the object seen through it* is explained. In contrast, *how* a given empty region looks is a function of its shape. So making sense of how our experience of a given region depends on that region itself depends on which question we ask; *which* or *how*. As I will argue, in the first case, empty space enters into the *context* of a causal explanation, but does not itself cause. But in the second, the role space plays is genuinely causal – this is insofar as its shape determines how it appears. I close by explaining why this result means we ought not invoke negative causation as a way of making sense both of the perception of empty space, and of the dependency of our experience of a particular empty region on that region.

The chapter patterns as follows. In §1, I outline Strawson’s Dependency Intuition on perception and I explain in what sense the case of empty space might be thought to contravene the intuition. In §2, I consider the ostensibly parallel case of the perception of time, and outline a critical difference - unlike time, space can affect how things appear. In §3, extrapolating from LePoidevin’s (2007) notion of chronometric explanation in the case of time, I sort among two ways in which the dependency condition might be met in the case of empty space – empty space can be part of the context of explanation - it can explain *locometrically* - or it can be directly causally efficacious, at least in its power to affect. In §4-5, I apply this distinction to an explanation of *which* region is seen and *how*. I argue that we should explain which region is seen locometrically, while the way it appears should be explained causally. In §6, I turn finally to the question of negative causation, and I explain why the solution I offer allows us to remain neutral on the reality of negative causation, while nonetheless denying that perceiving empty space involves negative causation.

In "Perception and its Objects", Strawson argues that we pretheoretically take perceiving to be an 'immediate' awareness of things 'outside us' (1998, p. 97). It is 'immediate' in the sense that we are not aware of any mediating sensory veil that we must pierce so as to perceptually encounter the world.⁹² And insofar as we perceive the world non-solipsistically,⁹³ we are aware of things as being 'outside us'. We perceive them as having a life beyond our fleeting, discontinuous perceptions of them. Strawson urges that our pre-theoretic concept of perception is thereby causal, at least in the following sense:

"The idea of the presence of the thing as accounting for, or being responsible for, our perceptual awareness of it is implicit in the pre-theoretical scheme from the very start. For we think of perception as a way, indeed the basic way, of informing ourselves about the world of independently existing things: we assume, that is to say, the general reliability of our perceptual experiences; and that assumption is the same as the assumption of a general causal dependence of our perceptual experiences on the independently existing things we take them to be of... It really should be obvious that with the distinction between independently existing objects and perceptual awareness of objects we already have the general notion of a causal dependence of the latter on the former" (ibid., p. 101).

I spell out this argument.

By perceiving things, we can come to know about them. For example, we can see that a lemon is yellow and tastes bitter, that it feels cool to touch. Indeed, the most 'basic' way we have of learning about lemons is by perceiving them. And this holds for our perception of the world at large.

Generally too, we suppose that our perception of the world is reliable, not that it is always veridical of course, but that the world is, for the most part, the way we perceive it as being. For Strawson, this assumption of reliability is essentially the assumption of a general causal dependence of our perceptual experiences on what

⁹² This follows the use of 'immediate' used by Bermudez in the last chapter.

⁹³ That is, we distinguish between our experiences and what they are experiences of. See Strawson (1961, p. 69).

they are of. Importantly, though, this is not something about which we theorise. Rather, says Strawson, it is implicit from our conceptual scheme from the start. Otherwise we would not be able to think of perception as a way of finding out about the world. This, then, suggests a requirement on what it takes for something to be perceived, at least insofar as we *understand* what it is to perceive something.

For something to be perceived is for our perception of that individual to depend on that individual in such a way that makes our experience of that individual a reliable way of coming to know how that individual is. Call this Strawson's Dependency Intuition - 'intuition' since it is supposed to be, compellingly I think, pretheoretic. In this chapter I ask how this requirement might be met in the case of space.

As have I noted, however, the case of space is peculiar. In Chapter Two, I argued that space is efficacious insofar as it is apt to affect its occupants. But in the last chapter I quoted Bermudez's reasonable denial of this much - reasonable because, again pretheoretically, and unlike objects, we don't perceive space to 'enter any reaction, exert any force or absorb any energy' – something that Nerlich insisted. But as such, space doesn't appear to be the kind of thing that could be a relatum of a causal relation. So, given that fact that we *can* perceive empty regions, or so the Direct View urges, if Strawson's Dependency Intuition is to go through in the case of empty space, we need to understand how we can make sense of our perception of a region depending on that region in a way that does justice both to our pretheoretical understanding that the perception of things depends on those things, and the intuition that empty space *seems* inefficacious.

In the next section, I make a start at providing a response by drawing a rough comparison with the case of time. First, though, a clarification concerning the scope of my enquiry.

The claim that experience depends on its objects should be sharply distinguished from a dialectically related issue about the ontology of experience – one whereby the causal theory of perception is supposed to yield a specific understanding of what it takes to be an experience: one on which hallucinations and perceptions are type-identical

mental states of the same metaphysical nature. The question as to how experience depends on its objects is neutral on the ontology experience.⁹⁴

2.

For LePoidevin, a causal theory is “almost irresistible” in the case of perception (2007, p. 23) and, like Strawson, he is primarily concerned with the epistemic status of perception. We have perceptual knowledge of how things are and it might be wondered how. He advocates a causal theory of perceptual knowledge, one on which “the causal chain... contains the truth-maker of the belief” (ibid., p. 24). Later it will become plain just how appropriate the metaphor of a ‘chain’ is, as well as the idiom of ‘containment’. First, though, it is worth stating the principle he takes as a working hypothesis - *The Causal Truth Maker Principle*.

The Causal Truth Maker Principle says: Perceptual beliefs that qualify for the title ‘knowledge’ are caused, in part, by their truth-makers. For LePoidevin, then, which perceptual beliefs *are* knowledge is a function of how they were caused. As such, his emphasis is different to Strawson’s. Strawson argues that *because* we treat perception as knowledge yielding, our *conception* of perception is causal. LePoidevin, however, adds an assumption that Strawson doesn’t broach, but that helps bring the peculiarity of the case of space into view. Truth-makers for our perceptual beliefs “have to be capable of being causally active” (ibid., p. 31).

Now, in the case of time, it is not so difficult to see how this might be puzzling, and indeed, as LePoidevin notes, even non-sensical depending on one’s metaphysics. For example, if you are a presentist about time – a theorist who takes it that only the present is real and existent – then how can you have beliefs about duration and succession that involve earlier and later times? How can non-existent future times be causally active now? But metaphysics aside, since experience is confined to the present, it might be wondered how we can even experience such things. The thought

⁹⁴ See Nudds (2009) for an exposition and discussion of this dispute.

that we directly perceive duration and succession certainly isn't tempting, or so LePoidevin says. We might wonder why. He offers three reasons.

First, time can't modify input. This, he says, is quite unlike the case of spatial properties like shape. Take for example the simple case of perceiving the shape of an apple:

"There is a relatively straightforward story to be told about the way in which the shape of, say, an apple can be an object of perception... the shape of the apple modifies the distribution and properties of light rays reflected from its surface...

[But] with time... it does not make sense to suppose that, when a given event such as the ringing of the telephone is perceived, the duration of that event, or its occurring after some other event, somehow modifies the input, allowing us just to *hear* its duration and position vis-à-vis other events. We are only aware of how long an event lasted when it has receded into our phenomenal past – when, in other words, the event has ceased to be an object of perception" (ibid., p. 98)

Here the assumption is that the perception of some property is direct if the property has modified the input of the sensory signal in terms of which it is perceived. But the property of lasting for some length of time can't modify a sensory signal at a time.

Second, since there are temporal limits on the present, some temporally extended processes, depending on their temporal extent, can't be directly perceived – for example, a peal of laughter or Mozart's twentieth piano concerto. Both events take time, so, on LePoidevin's understanding, the succession of their parts cannot be directly perceived; this is because this would entail their being perceived all at once, simultaneously. Depending on how 'tight' we draw the limits of the present then – which, incidentally, "are not chosen by us" (ibid., p. 76) – certain processes and events cannot be directly perceived.⁹⁵

Finally, to perceive one event following another we need only be aware of the events themselves. The temporal interval 'in which they are' – understood on the model of

⁹⁵ Cf. Soteriou (2007, 2010), Phillips (2010) and Crowther (2009).

space – plays no role at all. Or put somewhat differently: How can we perceive absolutely empty time? The question hardly seems to make sense.⁹⁶

The puzzle in the case of time, then, is that despite all this we can nonetheless form beliefs about order and duration *on the basis of our perceptions*. Moreover, such beliefs count as perceptual knowledge. But given the requirement that truth-makers must be causally active, it is hard to see how. Before I consider this dilemma in more detail, consider the case of space.

Unlike time, space *can* modify input. In the passage quoted above, LePoidevin notes how the shape of the apple can modify the distribution and properties of light rays that hit the retina and in terms of which the apple is visually presented. In the last chapter, I noted a somewhat distinct way in which the shape of space can modify input; by affecting the geodesic paths along which light travels.

Second, while there are spatial limits on what can be seen – for example, we can't see things that are too small to discern and we can't see things in their entirety if they overflow our field of vision (for example, if you press your nose up against a door, you can't see the hinges or the handle) – we nonetheless experience as limited the region of space of which we have experience (see Richardson 2010). But in temporal experience we don't experience the boundaries of the interval that we call 'the present' – this is something Soteriou (2011) elucidates.

Likewise, though temporal experience is often *oriented* – this is inasmuch as the present is experienced as at the edge of a succession of times that are now past - it is not *perspectival* in the sense that spatial experience is. For example, observers that share the same space typically agree on what is happening now. But in the case of space, while observers may agree on what is happening in that region, their perspectives on what is happening are not identical.

Finally, and again unlike the case of time, we see objects *and the space in which they are*, a claim I detail further in the closing chapter.⁹⁷

⁹⁶ Though again see e.g. Soteriou (2011).

So what is the puzzle LePoidevin isolates in the case of time?

LePoidevin suggests that objective order and duration cannot be the causes of our perceptual beliefs concerning order and duration because order and duration relations do not have location.

“There is a clap of thunder at 4 o’clock, and the rain starts pouring down at one minute past 4. These events are readily locatable. But what of the temporal relation between them? That relation, even if we treat it as a trope, is not readily locatable at 4, or one minute past, or any time in between. And what of the rainstorm’s property of lasting 20 minutes? Where is that in time?” (2007, p. 102)

The assumption is, then, that causes must be located *in space* – something desideratum (L) gestured at in Chapter Two. The understanding of causation implicit then, is one whereby *causes are understood to be path-connected to their effects*.

Now, critically, the physical connections theorist (though not necessarily the theorist who treats connections as necessitating relations between universals) and the theorist that embraces negative causation must both assume this much. Biff, standardly conceived, flows *along paths*. But causation by absence occurs precisely because the biff that might have flowed along the path that connects the absence to its causal partner, doesn’t. The assumption is, then, that causes (even if one’s causal nexus involves absences) must be located and *path-connected to their effects*. This explains then why, in the case of perceptual belief, truth-makers, in being causally active, must be ‘contained’ in space. Similarly, if they are part of a ‘chain’, they must be path-connected to their effects. Yet it also makes clear why order and duration are problematic.

Order and duration are not located anywhere and there is no path *through space* that connects earlier and later times. So how can we have perceptual beliefs that, assuming the *Causal Truth Maker Principle*, count as knowledge about order and duration? It seems that either we must give up the principle or else we must relinquish the

⁹⁷ As Martin (1992, p. 189) writes: “We can think of normal visual experience as experience not only of objects which are located in some space, but as of a space within which they are located.”

plausible assumption that order and duration are acausal. LePoidevin's solution is to modify the former. He suggests:

“Instead of confining the explanatory relationship between perceptual beliefs and their truth-makers to one that is purely causal, we might expand it to include other, non-causal components of explanation”. (ibid., p. 116)

This strategy yields what LePoidevin calls the *Explanatory Truth-Maker Principle* (ETMP). This says: Perceptual beliefs that qualify for the title ‘knowledge’ have truth-makers that figure in a full explanation of the acquisition of those beliefs. On this principle, true perceptual beliefs need not be caused by their truth-makers. Rather, they need only be more weakly involved, namely, in contributing to a full explanation of the acquisition of those beliefs. In the case of time, he calls such explanatory involvement *chronometric* (ibid, p. 117), and he suggests that certain kinds of fact or property – namely when something occurred, or its duration – contribute to explanations in a way that is non-causal but which are nonetheless part of the full explanation of the relevant event.

Here are a couple of examples he offers:

- (a) Why did the firework explode at t ?
Because it was lit five seconds before t .
- (b) Why did electricity flow around the system?
Because two buttons were pressed simultaneously.

In (a) the order of events is explanatorily relevant to what happened at t , while in (b) the simultaneity of two happenings, itself non-causal, nonetheless explains a certain outcome. Such explanation, then, occurs in the *context* of causal explanation, but is not itself causal. It might be wondered whether a similar kind of explanation might be adverted to in the case of perceiving empty space – to echo LePoidevin, call it *locometric* explanation.⁹⁸

⁹⁸ Note, while this notion ‘echoes’ LePoidevin’s notion, it is not claimed to be analogous – the case of spatial perception is unlike the case of temporal perception in ways that make an explanation as to how

To begin, a disanalogy between the temporal and spatial cases should be reasserted. LePoidevin supposes that order and duration cannot be directly perceived. But I aim to pursue the thought, argued for in the last chapter, that empty space has visible properties that *are* directly perceived. This shores up a distinction noted earlier. LePoidevin urges that order and duration can't modify input. But I argued, after Nerlich, that empty space *can* modify input, and in Chapter Two I explained in what sense this modification might be considered causal – empty space has a kind of structural biff. Notably, then, the conception of causation embraced is wider than that allowed by the physical connections theorist and is rather in line with the functionalist approach favoured by Schaffer in his treatment of negative causation. To this extent, it is worth drawing attention to the pluralist understanding of casual explanation that Strawson likewise allows.

In the passage quoted at the outset, he writes of the presence of the thing as “accounting for” or “being responsible for” our experience of it. This, then, recapitulates Grice who, in his “The Causal Theory of Perception” (CTP), writes, not dissimilarly:

“If we are to deal sympathetically with the CTP we must not restrict the Causal Theorist to the verb ‘cause’; we must allow him to make use of other members of the family of causal verbs or verb phrases if he wishes. This family includes such expressions as “accounts for”, “explains”, “is part of the explanation of”, “is partly responsible for”. (1961, pp. 144-145)

With this in mind, we can thereby weaken the Dependency Intuition so as to capture the spirit of this pluralism. We can allow that for something to be perceived is for that

we can have perceptual beliefs about time disanalogous to an explanation of how we can have perceptual beliefs about space. A problem arises in the case of time since it seems we can have perceptual beliefs that involve times that are not now present. But in the case of space, the relevant regions *are* present; as I have argued, they are directly perceived. This, then, explains how we can have perceptual beliefs about empty space – because we perceive it. Even so, there is something to recommend the expository strategy I have been pursuing. The difficulty that arises in the case of time seems to stem from the fact that the relevant truth-makers are neither causally active nor located in space. Similar difficulties seem to attend the case of the *perception* of empty space. Empty space appears inefficacious – this was Bermudez’ intuition – and likewise space itself is not located anywhere.

thing to be responsible for, to account for, or to be part of the explanation of *our perception of it*.⁹⁹

Now, chronometric explanation clearly meets the dependency requirement. For the order in which things happen, or when they happen, is part of our explanation as to why they happened. Still, as LePoidevin insists, chronometric explanation is not causal, but arises only in the context of causal explanation. This, then, allows us to reify our question: Does space meet the dependency requirement in appearing in the *context* of causal explanation or as being genuinely causal? As we will see, what response we give depends on which question we ask. For in asking which region is seen or how it appears, the role played by space in our explanation is distinct. In the first case, as I will argue, the role played by space is *locometric*. Space separates objects and perceivers. So when an empty region is seen, the region seen is the one that transmits the light in terms of which *the object seen through it* is visually presented. While in the second case, although space plays a role in transmitting light, its shape structures the light, and so causally affects how it (*viz.* the region) appears.¹⁰⁰ I outline these in turn.

4.

In his celebrated paper, Grice gives an account of a peculiar case of seeing. Suppose it looks to some subject as though there is a pillar at a certain distance and direction from the perceiver, and that there actually is a pillar at that place. However, imagine too that, unbeknownst to the perceiver, a mirror is interposed between it and the pillar such that a numerically distinct pillar is reflected. What makes it the case that it is correct to say that the reflected pillar is seen and not the pillar behind the interposed mirror? Says Grice: it is “extremely tempting” (1961, p. 142) to explain this linguistic fact by saying that the second pillar was causally irrelevant to how things look.

⁹⁹ Photons are partly responsible for our perception of objects, but not for our perception of them – we don’t see them.

¹⁰⁰ The shape of the region through which an object is seen affects the way the *object* appears. The claim, however, is that the shape of space also determines the appearance of the region itself as a function of how the object seen through it appears.

Notably, the question as to which region of space is seen in this case, including empty regions, is never asked, but I leave aside questions of mediated perception until Chapter Seven since they pose special difficulties. Even so, the general significance of Grice's exposition is plain. Which pillar is perceived is the one on which the subject's experience depends *in a way that is appropriate to seeing*. How should we understand this notion?

The standard way of construing appropriateness is by contrast with *inappropriate* cases. For example, suppose an "expert" contrives to 'trap' a subject, such that it looks as though there is a clock on a shelf, but the shelf is empty. The example is Grice's and he concludes: we would not be inclined to say that the subject saw a clock on the shelf for the clock apparently seen plays no role in bringing about the experience – there is no clock. Hence, the way in which the subject's experience depends on its cause – the expert – is inappropriate to seeing.

What counts as *seeing*, then, is experience that depends on its object and not on some ruse. It might be wondered how this relation of dependency should be elucidated. Grice suggests only that we leave a gap – a "blank space" – to be filled in by the specialist:

"I suggest that the best procedure for the Causal Theorist is to indicate the mode of causal connexion by examples... for example, when I look at my hand in a good light, my hand is causally responsible for its looking [to] me as if there were a hand before me... whatever that kind of way may be and to be enlightened on that question one must have recourse to the specialist". (ibid., pp. 143-144)

In a later article, however, David Pears proposes to go "further" than Grice (1976, p. 31), suggesting that we can fill this "slot" now "with material already available to everyone". His proposal is that we can elaborate Grice's notion of appropriateness by considering what is involved in occupying the right *position* on the appropriate causal line. The following case is offered as illustrative:

Say a subject is facing a door, the handle of which is illuminated by a torch behind the subject. It is true that the torch caused (or contributed to causing) the experience of

the handle, but false that the subject saw the torch. This is because the torch is said “to occupy the wrong position on the causal line leading to [the experience]”. (ibid., p. 26). What would occupying the right position involve? We are told:

“The door-handle occupies the right position, but the torch does not. What this means in the case of sight is, roughly, that the door-handle is the last object off which the light-rays are reflected, but the torch is not”. (ibid., p. 28)¹⁰¹

Critically, then, *where* an object is makes a causal difference to whether it is seen, which in turn suggests a structural parallel with cases of chronometric explanation. Just as *when* an event occurred enters only into the context of an explanation, perhaps *where* it occurred does likewise. Indeed, this is typically why places are thought be acausal or inefficacious. What matters is only what causally efficient entities occupy those places.¹⁰² Consider how the parallel runs.

In perception, *where* an object is makes a difference to *who* sees *what*. Just as we can ask why the firework exploded at *t* (because it was lit five seconds before), we can wonder why John saw the ball (because he was standing in front of it). We can, however, vary our emphasis in asking this much. For we can ask:

(a) Why did John see the ball?

Or

(b) Why did John see the ball?

We can bring out the force of this shift contrastively. In asking why did John see the ball, we are asking: why did John see the ball and not (say) the horse. And here we need not have recourse to quite so physical an explanation as Pears offers above. We can state merely that John was not facing the horse, or he was looking the other way, or something stood between him and the horse; responses that appeal to orientations, directions, and places – *spatial notions*. Likewise, in asking why did John see the ball (and not Mary), we can respond: because he was looking through the keyhole and she

¹⁰¹ As he notes, however, this would have to be refined to deal with men in armour, mirror images, images filtered through water and so on – I consider the case of mediated perception in Chapter Seven.

¹⁰² In Chapter Two, I cast doubt on this supposition – the assumption of acausality fails to take into account the peculiar way in which space can meet desideratum (L). Since local regions can vary in their curvature, they can affect material located in and passing through them.

wasn't – viz. he was *by* the keyhole and she wasn't. That is, something about John's location meant that he saw the ball and not Mary.

Finally, consider an experience of one of two indistinguishable items – plastic ducks Huey and Dewey.¹⁰³ We might ask what makes it the case that a given experience depends on Huey and not Dewey (when an experience that depends on Dewey would have been qualitatively indistinguishable). The answer is, of course, that in the latter case Huey occupies that right position on the appropriate causal line, or to paraphrase: the subject is facing Huey and not Dewey.¹⁰⁴

So, questions as to who is where and looking in what direction, as well as what is oriented at the places that fall within the subject's field of vision, all arise in the context of explanations as to who experiences what when. But such features of the relevant explanation are only contextual. It remains the case that just as John doesn't cause it to be the case that he sees the ball, but is simply in the right place to see it, the place the ball occupies doesn't cause itself to be seen.

Now, ascertaining which object is seen by such measures is fairly straightforward. Which object is seen is the one on which a subject's experience appropriately depends. This involves occupying the right position on the right causal line, and, as I have indicated, space plays a locometric role in such cases. But empty space isn't at a position, so how do we determine *which* region is seen? And what role does the relevant region play in explaining this much?

In the last chapter, I argued that empty space has visible properties that are directly perceived so long as something is seen through the relevant region. But this suggests a way of determining which *region* is seen. The region one sees is the region that transmits the light in terms of which one's occurrent visual experience of objects seen through it is explained. In non-mediated perception, this is just the region one sees the object through. But as such, the role of space in determining which empty region is seen is also locometric. It enters into the context of the explanation of how the object *seen through it* is seen – it is the path through which the biff flows that explains the

¹⁰³ This example may be recognised from Martin (2002).

¹⁰⁴ Note that the situation is a little different in cases of mediated perception – see Chapter Seven.

visual experience of the object. Which empty region is seen, then, is explained locometrically. But, as such, particular empty regions don't directly cause themselves to be seen, though our perception depends on them; although we see empty regions by seeing objects through them, their role in explaining how those objects are seen is locometric – they merely transmit the biff in terms of which those objects are seen. But this being so, we can after all reconcile Strawson's Dependency Intuition with Bermudez's assumption of inefficiency. Strawson's Dependency Intuition is honoured because it is true that our perception of a given region (assuming that the region *is* seen, and that an object is seen through it) depends on that region. However, since the dependency involves the transfer of biff, empty regions, precisely because they transmit biff, appear inefficient – they merely *transmit* biff. What's more, like Huey and Dewey, regions of space in our vicinity are qualitatively indistinguishable. But just as qualitatively indistinguishable experiences of the different ducks are distinct insofar as they depend on a different duck in each case, experiences of qualitatively indistinguishable though distinct regions of empty space likewise depend on distinct regions – the region that transmits the biff that explains the seeing of an object seen through it.

So much for an account of how which region is seen depends on that region.¹⁰⁵ What about how a given region appears?

5.

Above I noted LePoidevin's contention that time fails to structure input and in what sense space is different. Space does affect input. Depending on its shape, space can determine how things seen through it look. To requote Nerlich:

¹⁰⁵ The question concerning *which* object is seen in a given circumstance is typically posed as a means of excavating whether there are causally necessary and sufficient conditions on seeing. (For example Lewis asks what it is "for visual experience to match the scene before my eyes" (1980, p. 240), where here 'match' is understood informationally. A visual experience 'matches' the scene that caused it if its content is correct *and*, and this is Lewis's contribution, if it is counterfactually dependent on that scene). When I ask which *empty region* is seen, however, I do not aim to determine conditions necessary for seeing empty regions – I sketched these in Chapter Three – but rather to make sense of the peculiar way in which the Dependency requirement is met in the case of empty space.

“So, as we look at distant things that lie beyond the hole, the photons by means of which we see them sometimes pass through the hole and sometimes not; things will change their appearances as the visual angles subtended by the various paths change, just as things change their shapes and shimmer in a heat haze or when seen through some inhomogeneous physical medium like uneven glass”. (1994, p. 38)

Hence, although space does not affect the informational character of light as objects do – it does not absorb, reflect, or scatter - it *can* affect the way light is transmitted, with consequences for how things appear (recall, Nerlich’s comparative claims work by drawing parallels with paradigmatic visual experiences that we do have). But in this sense, perception of how space itself appears depends on the character of that region; it depends on how things seen through it look. So, this being so we might ask: Is this dependency genuinely causal or merely locometric?

The dependency that explains which region is perceived is, I argued, locometric – the relevant region only enters into the context of the explanation. But in the case of explaining how it appears, the *intrinsic* properties of the region itself – its shape – must be invoked. But to this extent, how the region appears depends on *how it is*; *how the region is* is genuinely causally explanatory of how it appears.¹⁰⁶

6.

So far I have distinguished two ways in which the perception of empty space depends on the region seen - *which* region one sees is explained locometrically, while *how* it appears is explained causally. In this closing section I argue that both conclusions allow us to resist the thought that the perception of empty space involves negative

¹⁰⁶ This contrasts with the ‘Fregean’ representationalist account of spatial experience recently defended by Brad Thompson (2010) and Chalmers (2006). Thompson argues that it is consistent with the phenomenal character of our spatial experience that the underlying geometry of the space represented could vary radically. Indeed, the analogy he draws is with inverted spectrum cases (see Block 2003). Hence, if we hold him to the analogy, he should have to maintain that regions, the curvature of which is as distinct as red is from green (for example, regions the curvature of which is concave or convex), could have the same phenomenal appearance. If the Direct View defended here is correct, this Fregean position is false. In particular, the Fregean overlooks the substantial discovery that only regions of constant curvature permit free mobility (see also Chapter Six). Since we can move through space, and the curvature of space determines how it appears, it is not consistent with the way it appears that its curvature could be highly convoluted.

causation, which in turn honours the promise I made in Chapter Two – to explain why perceiving empty space does not involve negative causation.

Say an opaque object is seen at some location. It is true that, at that location, see-through space is not seen – as David Katz notes, it is as though opaque objects offer resistance to the eye, “a barrier beyond which the eye cannot pass” (1935, p. 8).¹⁰⁷ Conversely, however, if a visible object is absent at that region, then, if what I have argued is correct, see-through empty space – empty space in a ground sense – is seen. As such, the presence or absence of objects might be thought to be *causally relevant* to the seeing of empty space.

This notion of causal relevance contrasts with that of causal operativeness. Causally operative entities are biffy. But on the assumption that causes are difference makers, even absences, while not causally operative, can be causally relevant. As Kukso (2006) argues: When an entity makes a difference, a difference is made *between* two total states of the universe. Hence “both the presence and the absence of the entity is required in order to establish its causal relevance” (2006, p. 32). Here the comparative importance of ‘between’ is critical. This is since, in order to determine whether an entity makes a difference, we need to compare or trace the differences between *two* total situations – one in which the entity is present and one in which it is absent. The question is: Is the absence of visible objects at empty regions causally relevant to how those regions appear? If so, then perceiving empty space might be thought to involve negative causation.¹⁰⁸

Before I address this question, two notes concerning causal operativeness and relevance should be borne in mind.

First, space itself is a locometric condition on the coherence of Kukso’s argument. This is because the substitution or removal of objects – and hence their presence or

¹⁰⁷ Recall too Mizrahi (2010), quoted in Chapter Three: “in order to see behind or through a body, there must be no visible obstacle” (p.4). As I argued, there being no visible obstacle – no thing – does not mean that nothing is visible.

¹⁰⁸ Importantly, this question is not merely a question as to whether the absence of objects is *explanatorily* relevant to the seeing of empty regions (it is, since otherwise they would not be seen), but whether the absence of objects at those regions *itself* causally explains the region being seen.

absence – is *at some place*. Second, consider in what sense that affect/effect distinction, introduced in Chapter Two, cross-cuts the relevance/operativeness distinction.

While it is true that efficient entities are operative, it doesn't follow that causally relevant 'entities' (in this case absences, which we may not wish to entify), can *affect*. Causal relevance is determined by examining and contrasting two distinct worlds – worlds that differ only in the presence or absence of some entity at a location. But causal affect doesn't involve contrasting two distinct worlds at all. Rather, in the case of space, its affect flows from the intrinsic properties that a given region has. There are no other worlds 'between' which we must range so as to establish the relevant affect. So, does the absence of objects at certain regions causally explain those regions being seen? One way to see why not is to turn once again to the questions of *which* and *how*.

Perceiving the absence of a visible object at a region cannot determine which region one sees (even if absences do have causal powers). This is because unlike the regions at which they are, absences do not *have* particularity.¹⁰⁹ The intuition of dependency, then, can't be honoured: in emphasizing a *lack* of biff, the appeal to absence fails to capitalise on the locometric role of space in *transmitting* biff. This in turn points to a disanalogy:

While it is true that the presence or absence of light at a region (say) is relevant to experience of that region – it is experienced as either bright or dark – the presence or absence of an object at that region is not the *sole* determinant of how that region appears. As I have argued, empty space is seen *if an object is seen through it* and the flow of biff from that object is involved in the explanation of which region is seen – namely the one that transmitted the biff in terms of which the visual experience of the object seen through it is explained. Hence, it is the *presence*, not the absence of an object, that our explanation requires.

What about the *how* question? Does the absence of an object at a region causally explain how that region appears (i.e. in the sense that it is causally relevant)? If what

¹⁰⁹ As I will argue in Chapter Five however, *absential locations* can be intensionally individuated.

I have argued in the last chapter is correct, then surely the answer is 'no'. The appearance of empty regions is not only a function of the absence of objects at those regions, but is explained too in terms of its shape. But as such, it is the *positive* character of the region that explains how it looks, assuming too there is an object seen through it. But this suggests finally not only that the perception of empty space does *not* involve negative causation, it is not even a species of absence perception. I pick up this thought in the next chapter. Before that though, I revisit Strawson.

In a celebrated passage, Strawson writes of the causal relation between perception and its objects:

“We are philosophically accustomed – it is a Humean legacy – to thinking of the simplest and most obvious kind of causal relation as holding between types of item such that items of both types are observable or experienceable and such that observation or experience of either term of the relation is distinct from observation or experience of the other: that is, the causally related items are not only distinct existences, but also the objects of distinct observations or experiences. We may then come to think of these conditions as constituting a requirement on all primitive belief in causal relations, a requirement which could be modified or abandoned only in the interests of theory. Since we obviously cannot distinguish the observation of a physical object from the experience of observing it – for they are the same thing – we shall then be led to conclude that the idea of the causal dependence of perceptual experience on the perceived object cannot be even an implicit part of our pretheoretical scheme, but must be at best an essentially theoretical addition to it...but the difficulty is spurious. By directing out attention to causal relations between objects of perception, we have simply been led to overlook the special character of perception itself. Of course, the requirement holds for causal relations between distinct objects of perception, but not for the relation between perception and its objects. When x is a physical object and y is a perception of x , then x is observed and y is enjoyed.” (1998, p. 102)

Strawson's point is that while perceptual experience is causally dependent on its objects, both cannot be distinguished. We might wonder why. Typically, individuation is spatial, but experiences cannot be spatially distinguished from their objects. In my idiom, it might be said that this is because, while a subject is path-connected to the objects of her experience, no subject is path-connected to her experience. Rather, episodes of experiencing occur where the subject is. Equivalently,

however, it seems to me that we might be likewise “led to overlook” the peculiar status of space as an object of perception. For, unlike objects, we are not path-connected to the ‘outside’ in which they are – the space we are in.

in nuce:

I have argued that which region one sees is the region that transmitted the biff in terms of which one’s occurrent perceptual experience of the objects seen through it is explained. In such cases, the role of space in explaining which region one sees is locometric. Second, I argued that how regions appear depends on how those regions are – the intrinsic curvature of a given empty region determines how it looks. This flows from the Direct View.

Finally, I suggested that, since the structural biff of space is positive, we shouldn’t invoke negative causation as a way of explaining our perception of empty space. Though the absence of visible objects at regions is part of the explanation of how those regions appear, it is not the sole determinant. What’s more, since absences lack particularity, they cannot determine which region is perceived.

Looking for Nothing

It is now five minutes to eight,' said Neville. 'I have come early. I have taken my place at the table ten minutes before the time in order to taste every moment of anticipation; to see the door open and to say, Is it Percival? No; it is not Percival.' There is a morbid pleasure in saying: "No, it is not Percival." I have seen the door open and shut twenty times already; each time the suspense sharpens. This is the place to which he is coming. This is the table at which he will sit. Here, incredible as it seems, will be his actual body.

- Virginia Woolf, *The Waves*

In the last chapter, I alluded to the claim that I aim to defend and reify in this chapter – namely, that the perception of empty space should not be treated as a species of absence perception, at least if the Direct View is embraced. I begin by considering an account of perceiving empty space that I have not yet commented on – a position, recently defended by Matthew Soteriou (2011) and Louise Richardson (2010), which I have called earlier the Structural View.

Unlike the direct account of seeing empty space elucidated in Chapter Three, the Structural View is indirect insofar as it emphasises not the nature of space, but the character of experience, and specifically its structural features. In what follows, I compare both views, and show in what sense the direct account I favour is compatible with the structuralist position, where this is read descriptively, not transcendently.

The chapter runs as follows. In the first part, I outline Roy Sorensen's take on the nature of absences and their perception, picking up a thread from Chapter Two (§1). I then detail a puzzle Soteriou raises for Sorensen and I set out his positive solution. I explain how Soteriou dialectically positions his proposal in opposition to the cognitive account of silence perception favoured by Brian O'Shaughnessy (§2). In §3-4, I set out Soteriou's application of his proposal to the perception of empty space, and I explain why, if the direct view is correct, a transcendental reading of this treatment may prove too demanding. In the second part, I outline in what sense the direct account diverges from the Structural View (§5-6), and I close, in §7, by showing how the direct account has the resources to steer a conciliatory path between

an attitudinal take on the ontology of absences, in a sense to be explained, and that favoured by Sorensen, Soteriou and Richardson.

1.

In *Being and Nothingness*, Sartre tells a well-known story. When he goes to the café to meet Pierre, he perceives Pierre's absence. Notoriously, this leads Sartre to suggest that Pierre's absence depends on a frustrated expectation that he would be seen, a characterization Richard Gale describes as 'attitudinal' (1976, pp. 55-61); Pierre's absence depends on the presence, in Sartre, of a psychological attitude, an expectation that Pierre will be seen. In *Seeing Dark Things*, Roy Sorensen argues against this attitudinal take on the ontology of absence, sympathizing instead with a position defended by C. B. Martin.

For Martin absences are "*localised* states of the world or universe" (1996, p. 58), which, in being localised, are spatio-temporal (*ibid.*, p. 59). But as such, absences are not *things* – "we need to avoid the reification of absences" (*ibid.*, p. 62) - and nor do they have any properties. Yet being propertyless, nor are they biffy or, in the terminology introduced in the last chapter, causally operative. Still, Sorensen urges, absences are causally relevant. Hence, *contra* Sartre, their existence is mind-independent; they are objective.

The ontology of absence, however, is not Sorensen's prime concern. Rather he aims to make sense of absence perception, though here, naturally, a dispute over the ontology of absences has consequences for an account of how they are perceived. It is worth emphasizing in what sense he differs from Sartre.

For Sartre, absences are individuated attitudinally. Hence, perceiving them also involves the relevant attitude. For Sorensen, however, whether or not an absence is perceived depends not on the presence or absence of a specific *psychological episode*, but on whether or not the presence of an absence at some localised region of the world is causally relevant to the perceptual episode enjoyed. But to this extent his position

also weighs against another theorist, one who may reject an attitudinal account of the ontology of absences, while nonetheless advancing an attitudinal account of their perception.

On the assumption that only biffy entities cause, and supposing that a CTP is assumed, it might be insisted that absences are *imperceptible* or are perceived only indirectly, their presence being inferred from a failure to experience anything – I sketched such a view in Chapter Three. But if absence ‘perception’ involves inference, it is attitudinal. Sorensen’s line on absences and in particular their causal nature tells against this theorist too, and this is so even while such a theorist might yet deny that the truth-makers for the relevant attitudinal episodes are, as Sartre seems to have it, subjectively individuated. So why does Sorensen dissent?

In Chapter Two, I sorted among theorists who admit or banish negative causes from their causal nexus – genuinists and non-genuinists respectively. Chief among the latter are those who emphasize the flow of biff. Sorensen is less canonical in this sense. He advances a CTP but embraces negative causation; to this extent he might be thought a causal functionalist. For the functionalist, recall, whatever plays the role or has the function of causally explaining a certain event is a cause. But this being so, absences need not elude the CTP after all. Absences make a difference – they are causally relevant – and causal relevance is all a CTP needs. This, then, might seem to figure against the hybrid position outlined above, for although the hybrid theorist may grant that absences are localised, mind-independent states of the world, she denies that absences are directly perceived.

To be clear, then, the ontology of absence that informs Sorensen’s perceptual account is dialectically janus-headed: On the one hand, it leads to a rejection of an attitudinal view of the ontology of absence – the Sartrean position – and on the other, it disarms an indirect account of absence perception on which the relevant ‘perception’ is mediated by a psychological episode. I detail this position later. For the moment, consider why Sorensen might suppose that mere causal relevance sufficient for a CTP to hold.

In the last chapter, I sketched Kukso's argument for the causal relevance of absences: When an entity makes a difference, a difference is made between two total states of the universe. But this being so, says Kukso, "both the presence and the absence of the entity is required in order to establish its causal relevance" (2006, p. 32). How might this translate to the general case of perception?

Consider two possible states of a toy universe – a room in which a light is switched on (state *a*) and off (state *b*). And consider the experience of a subject in such a universe. We might ask: Does the switching on and off of the light make a difference to the subject's experience?

Clearly, the answer is 'yes'. In the first instance the subject sees light, and in the second, darkness. Since, however, the difference between the subject's experiences is explained by adverting to the presence *and* absence of light, it follows that the absence of light, like its presence, is causally relevant to an explanation of the nature of the subject's experience at both *a* and *b*. For had the light been absent at *a*, the subject would have perceived darkness not light, and had the light been present at *b*, she would have perceived light not darkness. Hence, whether or not the light is absent or present at a time makes a causal difference to the subject's experience *at that time* (assuming of course that the perceiver *is* counterfactually sensitive to the presence or absence of light at a time). Sorensen adopts this thought, albeit by appeal to a somewhat different tiny universe – the universe of a toad's stomach. In the passage below, he recalls a boyhood fascination:

"As a boy, I fed lightening bugs to my pet toad. To my delight, the bugs would continue to light up after being consumed. I could *see* the toad's belly light up periodically" (my emphasis, 2008, p. 62).

This emphasis on *seeing*, the italics denoting perceptual success, helps spell out what the requisite counterfactual sensitivity requires.

As Sorensen explains, a mere absence of experience at a time, even if subjectively indistinguishable from a genuine experience of absence, cannot be sufficient for seeing. This is because, in instances where there is a brute absence of experience, the

perceiver fails to be counterfactually sensitive to the presence or absence of light. The relevant sensitivity is simply lacking.

“To see a lightning bug *flashing* in the dark, we need to see the absences of light between the light flashes. Mere alternation between seeing the light emission and failing to see does not suffice for the perception of flashing. Consider an electrical device that cyclically blinds a subject. If the subject is viewing a steadily glowing light and the cyclical blinder is present, the light may appear to be flashing. The blinder can be synchronised with a flashing light, so that when the blinder is on the blinker is off and vice versa. Now the light is flashing and looks like it is flashing. But the subject does not see the light *flashing*” (2008, p. 241).

Unsurprisingly, this example of so-called veridical hallucination – where there is ‘match’ in the informational content of the experience without counterfactual dependence¹¹⁰ – takes for granted the particular ontology of absence that Sorensen assumes. That is, where the absence of light at a particular spatio-temporal region is an objective state of how things are. But importantly for Sorensen, it also argues against the attitudinal view that nonetheless tallies with this ontology; it supposes that, despite being causally *inoperative*, absences *are* causally relevant, and they are causally relevant because what makes a difference to the subject’s experience at a time is sensitivity to both the presence *and* the absence of, in this case, light.

Now, *prima facie* this might suggest that in order to see either light or darkness a subject must be exposed to both. But in fact Sorensen resists this extrapolation. There can, he says, be seeing *without* light:

“If I am seeing without any current light, does it follow that I have been exposed to light earlier or later? No. Babies are born seeing... Consequently, if a girl is born into an utterly dark room, the infant sees the darkness even though she has never seen the light. If she dies soon after birth, then she will have seen without ever having been exposed to light...Sight only requires sensitivity to light” (ibid. pp. 264-265).

In the next section, I raise a puzzle for this view.

¹¹⁰ See Chapter Four, fn. 96.

In a recent paper, Matthew Soteriou poses a dilemma for Sorensen. Say I am asleep, surrounded by silence. Even while sleeping, I am sensitive to sound - if a door were to slam, I would wake up. Even so, I am not thereby sensitive to the *absence* of sound. Hence, mere sensitivity to sound won't do for the perception of its absence. But likewise, mere sensitivity to light won't do for the perception of darkness; though I may wake up if a lamp is turned on, in being so sensitive, I am not thereby sensitive to the absence of light (cf. Sorensen: "Sight only requires sensitivity to light"). Of course, our intuitive response as to why we are not so sensitive is that we are *asleep*. But this still leaves open what the import of being awake in the context of absence perception genuinely is.

On the face of it, it might be thought that the attitudinal view of absence perception is thereby recommended, since entertaining attitudes involves being awake. For example, if the presence of an absence must be inferred from a failure to experience anything positive, it might be thought that a condition on hearing silence is the ability to *introspect* an absence of experience of sound. Such a view is associated with Brian O'Shaughnessy.

For O'Shaughnessy, hearing silence is a species of coming-to-know *that* it is silent. As such, a subject doesn't *perceive* silence but only comes to know that it is silent in the absence of any introspectible experience of sound. Sorensen has an argument against such a view: you can experience silence while being agnostic about whether or not you are hearing silence, as a wounded soldier might while wondering whether or not he has gone deaf. I return to this objection below. First, I set out O'Shaughnessy's proposal. Then I consider a problem Soteriou also raises for O'Shaughnessy, in turn sketching Soteriou's positive account.

O'Shaughnessy's discussion of absence perception is elucidated in the context of a discussion of what distinguishes thought and perception. Thoughts, he claims, may agree or disagree with reality – that is to say, thoughts have truth conditions. But perceptions, which are extensional, can't have truth conditions - "we perceive

objective phenomenal realities like material objects, or colours or relations” and such entities are not apt for being bearers of truth (2000, p. 328). Still, O’Shaughnessy wonders, suppose there *were* such a ‘truth-screen’ in perception, what would be entailed? Namely, that we should be able to have *negative* perceptual experiences – that we should be able to *perceive* the ball *not* being blue, the girl failing to smile, silence. The question is: Can we?

O’Shaughnessy takes perceiving silence as his parade case among ostensible negative perceptual experiences. Importantly, though, while he agrees that silence is an absence, a nothing, he denies that *all* absences, understood as privations, are candidates for treatment along the model he will offer. Darkness is an absence of light, but unlike silence, which is an absence of sound, darkness has phenomenal reality – we see darkness as black (albeit contingently, since darkness might have looked some other way). In contrast, there is no sound of silence. Indeed, this is just what “silence” means. As such, this reveals a significant distinction.

The concept of darkness is as of an appearance, whereas the concept of silence is as of an absence. Hence, the question as to whether we can perceive absence is, in the hands of O’Shaughnessy, a query *as to whether we can perceive entities that lack phenomenal reality* or, in O’Shaughnessy’s idiom, are not ‘positivities’. But, on this understanding, darkness *is* a positivity - it has phenomenal reality despite its privational nature.

As I see it, two features of this account require special emphasis.

First, though darkness may have looked some other way, it is difficult to make out an analogous sense in which silence may have ‘sounded’ some other way, hence the thought that the concept of silence is the concept of an absence – namely, of sound.¹¹¹

¹¹¹ It has been suggested to me by Andy Clark that particular silences – localised absences of sound – may in fact have particular phenomenal appearances. For example, in making sound recordings, the ‘silence’ in the recording space is also typically sampled and recorded. Silences differ from room to room. So a two-part recording of an aria say – if begun in a theatre, but finished in a cathedral – needs to have its silences ‘equalised’. Particular ‘silences’, then, may differ as a function of low level ambient noise and, more importantly, the shape of the environment in which that noise reverberates (which, in turn, suggests a parallel with the direct view – the shape of the recording space determines the phenomenal appearance of the relevant ‘silence’).

Still, one might ask: Is no-sound something one *hears*? Sorensen would say ‘yes’ – so long as you are counterfactually sensitive to sounds, you are counterfactually sensitive to their absence. O’Shaughnessy, however, resists this line of thinking.

For O’Shaughnessy, silence is not heard *not* because silences cannot exist or prevail at places (he thinks they do), or because silences are causally inoperative (though he surely does hold this view), but rather because perceiving is necessarily of phenomenal realities and the concept of silence is just *as of there being no sound* (rather than *sounding* a particular way – viz. silent). On O’Shaughnessy’s view, then, it simply makes no sense to say that we *hear* silence. Rather, when we ‘perceive’ that it is silent, there is no attendant auditory experience. But to this extent, we differ from the deaf.

O’Shaughnessy insists that the deaf lack auditory experience but do not ‘perceive’ silence and this is because, in the case of the deaf, an absence of auditory experience does not yield the immediate *knowledge* that one is surrounded by silence. Hence, though the deaf lack auditory experience, they cannot hear that it is silent:

“Hearing the silence is a special case of coming-to-know of contemporary silence: namely, that in which one’s knowledge arises immediately in an experience out of an absence of auditory experience which one knows to be a veridical perceptual reading. Therefore a cognitive attitude, with silence figuring in its content, is a necessary condition of hearing silence, as it cannot be in the hearing of sound (and animals must be unable to hear the silence). And to repeat: no hearing occurs when one hears the silence”. (2000, p. 329)

But this answers Sorensen’s objection. Sorensen noted that it is possible to hear silence while remaining agnostic about whether or not one has gone deaf. But we can recast this in line with O’Shaughnessy. A perceiver that lacks auditory experience can wonder whether she is experiencing silence *or* whether she has gone deaf. That is, she can wonder whether *her perceptual reading is veridical*. If it is veridical, then she experiences silence, but granted she only hears *that* it is silent if she also appreciates that she fails to hear anything because it is silent. This suggests a second feature of the account worth highlighting:

When O'Shaughnessy insists that perception is 'positivity all the way', he individuates the 'positive' as *that which has phenomenal reality*. Hence, on his account, 'positivity' need not always be predicated of biffy entities. That is to say, he does not seem to endorse the link assumed above, i.e. between causal operativeness and positivity. But this being so, he can thereby suppose that there *are* some privations we can directly perceive – that is, that we perceive non-epistemically. Darkness is a case in point. Below I suggest that empty space (which if read in an absolute sense is not a privation) falls into this category. First, though, consider Soteriou's worry and his positive account.

Given O'Shaughnessy's insistence on 'positivity all the way', Soteriou wonders how the *boundaries* of perceptual entities are to be perceived, here taking his cue from C. B. Martin. I re-quote from Chapter Three:

"The concept of an edge is the concept of a limit of where something is and where something isn't...The reference of the referring term 'world' is divided into presences whose limits are drawn by absence". (Martin 1996, p. 60)

For Soteriou, this suggests the experience of absence is not of "marginal significance":

"If the perceptual experience of the boundaries of some positivity is itself a positivity, then that positive perceptual occurrence may necessarily involve the experience of absence as well". (2011, p. 191)

Take the case of hearing a series of discrete beeps. On O'Shaughnessy's account, in order to hear the silence between the beeps, a subject should have to hear that it is silent, with silence figuring in the content of a cognitive attitude. Soteriou suggests that we can avoid this particular commitment (and the over-intellectualisation of experience it prompts – see Chapter Three) while nonetheless acknowledging the insight C. B. Martin isolates. The way to avoid this commitment, he suggests, is to recognise the respect in which we can have conscious perceptual contact with regions of space and intervals of time within which the boundaries of such positivities can be perceived. I explain this thought in the context of Sorensen's childhood universe.

When, as a child, Sorensen saw the lightning bug flash in the toad's belly, he saw, at a localised spatio-temporal region, namely that occupied by the toad's belly, the presence and absence of light. He reports how he was thereby able to keep track of the toad through darkness (at least for the most part):

“In the dim light of a porch lamp, I was seeing only the effect of the consumed lightning bug. I let my toad hop into the darkness because I could track him by seeing the flashes of the lightning bug. The hitch was that other lightning bugs would alight near the toad. I could not see which was the lightning bug inside the toad and which was the lightning bug outside the toad”. (2008, p. 62)

Soteriou's insight helps explain in virtue of what Sorensen's boyhood self could successfully track the toad.

Like Martin and Kukso, Soteriou treats absences as localised spatio-temporal states of the universe. But the key to perceiving them, he argues, lies in our conscious perceptual contact with the spaces and times at which they can be located or fill. This explains why Sorensen was able to track the toad: When absences are located in certain regions of space or fill certain intervals of time, and when we have conscious perceptual contact with those regions or intervals, absences need not *cause* themselves to be perceived. Rather, to perceive them we need only have conscious perceptual contact with the regions or intervals *in which they are*. On this understanding, then, Sorensen was able to track the toad, not simply because he was counterfactually sensitive to the luminosity of the bug, but because he had conscious perceptual contact with the regions of space and intervals of time within which flashes could successively appear and wane.

This, then, allows Soteriou both to preserve Sorensen's insistence on counterfactual sensitivity - when we are in perceptual contact with regions of space and intervals of time, we are counterfactually sensitive to the presence or absence of causally operative events at or within those regions and intervals - and to defuse the cognitivism of O'Shaughnessy's account, at least as it applies to silence. When we hear silence, we have conscious perceptual contact with intervals of time within which sounds might have been heard but aren't, and it is in virtue of such silences - temporally located,

particularised absences of sound – that the boundaries of sounds can themselves be heard.

But this explains, finally, why a sleeper, though sensitive to both sound and light, does not hear the silences and see the darknesses that surround her. She does not have conscious perceptual contact with the region of space and interval of time within which such absences are housed and extended.

In the next section, I outline Soteriou's application of this idea to the perception of empty space, thereby reifying a little what conscious perceptual contact with a region of space involves.¹¹²

3.

Soteriou suggests that it is part of the phenomenology of experience that, when looking straight ahead, the region of space of which you are visually aware is presented as a sub-region of larger space that has that region as a part. Moreover:

“When looking straight ahead you may be aware of regions of *empty* space – i.e. regions of space that are empty of visible objects. When looking straight ahead you are not aware of a region of space behind your head in that way – i.e. as empty of visible objects.” (ibid., p. 192)

Here Soteriou draws a distinction between being visually aware of empty regions of space and simply being aware of other regions that are not now visually experienced. In the latter case he notes that awareness of such regions is not to be explained by awareness of those regions as empty of objects that could be experienced. But this suggests that, in the former case, one's awareness *is* to be so explained. The following passage clarifies this thought:

¹¹² Though this discussion would benefit from consideration of Soteriou's treatment of time, I focus only on the spatial case.

“One might then think that a crucial component of the right characterisation of the way in which we are visually aware of regions of space, when are aware through vision of the spatial locations of objects, should accommodate the idea that this can involve the visual registration of an absence – one’s perception of regions of space as empty of visible objects. And it is this that allows us to perceive the boundaries of objects, by allowing us to perceive where things are not, as well as where they are.” (ibid., pp. 192-193)

Visual awareness of empty regions in the former sense, then, is explained by a subject’s visual awareness of the absence of visible objects at places, and this is what allows us to perceive the boundaries of objects.¹¹³ Still, we might ask: How can a subject be aware of the absence of objects at certain locations? Moreover, must the relevant experience thereby have a negative representational content – viz. such that ‘no-object’ figures in the content?

Soteriou argues against this thought. His proposal is that we can appeal instead to ‘*structural*’ features of the conscious character of visual perceptual experience. I spell this idea out.

To detail this notion, Soteriou harnesses a distinction between strong and weak forms of perceptual transparency. The notion of perceptual transparency is supposed to capture the sense in which, phenomenologically, when asked to characterise the nature of one’s experience, introspection uncovers *only* the mind-independent objects, properties and relations that one is aware of in having the experience. Soteriou characterises this as a ‘strong’ version of the transparency thesis – the emphasis is on mind-independent features of reality alone. In contrast, the weaker version allows that “when one attempts to attend introspectively to what it is like for one to be having a perceptual experience it seems to one as though one can only do so *through* attending to the sorts of mind-independent objects, qualities and relations one is apparently aware of in having the experience” (my emphasis, ibid., p. 185). He suggests that reflection on the conscious character of visual experience gives us reason to reject the stronger view. For consider: when you are aware of a region of space in front of you, you aware of that region as a sub-region of a larger space that has that sub-region as a

¹¹³ Soteriou glosses the notion of the “visual registration of an absence” in terms of “one’s perception of regions of space as empty of visible objects”. Presumably, then, the visual registration of an absence *is* the perception of regions of space as empty of visible objects.

part. Intuitively it might be thought - at least this is how Soteriou characterises it - that you are thereby aware of “something like a cone of physical space” in front of you (ibid., p. 193). Nonetheless, it does not seem to you that the *space* of which you are aware has boundaries - you do not think of the boundaries of this cone as boundaries of some *thing* of which you are visually aware. Rather, suggests Soteriou, we should think of the boundaries of the visual field as present in experience through one’s awareness of one’s sensory limitations.¹¹⁴ I detail this notion further.

In experiencing your visual field as bounded, you are aware of your sensory limitations in the sense that you are aware that there is *more* to be sensed than is currently sensed. But this in turn explains your awareness *both* of the presence of regions of which you are not now visually aware *and* your attendant sense that the region of space currently experienced is a sub-region of a larger space that has that region as a part. This brings into focus the import of the weaker version of the transparency claim:

You are aware of the boundaries of the visual field by attending to the mind-independent objects *that fall within them*. Hence, though you cannot attend to such boundaries directly, you can nonetheless attend to them through attending to mind-independent objects that fall within their bounds. But to this end, notice it does not matter *which* objects are perceived. Rather, argues Soteriou, it is an invariant feature of the conscious character of visual experience that you are visually aware of a region of space the limits of which are drawn by your sensory limitations. He describes this feature as ‘structural’, and concludes that it is this feature of experience that is involved in perceiving empty space:

“the correct explanation of the respect in which we can be consciously aware in vision of absence - e.g. of regions of space as empty of visible objects - will sometimes need to appeal to relatively invariant features of such conscious awareness”. (ibid., p. 195)

And why?

¹¹⁴ See Richardson (2010) for a detailed characterisation and defence of this claim.

Because when such structural features are part of the conscious character of visual experience, the space they delimit is experienced as a space within which objects *can be seen* - this delimited region is the region with which a subject has perceptual contact. But importantly, this also accounts for the sense in which a subject can be consciously aware of regions of space at which there are *no* objects to be seen. The subject is aware of such regions as regions where objects *could be seen*.

This makes plain the respect in which the structural feature Soteriou isolates is involved in seeing empty space – space in which objects could be seen but aren't. In the next section, I explore an assumption on which the account offered might be thought to spin: the thought that seeing empty space is a species of absence perception.

To conclude this section, it is worth noting in what sense the Structural View contrasts with the Direct View set out in the last two chapters:

On the Direct View, empty regions are seen when something is seen through them. On the Structuralist View, however, a subject is consciously aware of empty regions when she is aware too of the region of space with which she has perceptual contact as a sub-volume of a larger space. Assuming that our naïve category 'space' is absolute, it is worth noting how the notions of empty space in a ground sense and empty space in an *absolute* sense – the fourth sense detailed in Chapter One - are thereby brought into synchrony.

I now turn to an assumption the Structural View seems to embrace and which it is the goal of this chapter to renegotiate: the thought that seeing empty space is a species of absence perception. In §5, I try to establish what motivates this thought.

4.

For Soteriou, the perception of the boundaries of some positivity “may necessarily involve the experience of absence as well” (2011, p. 191). Even so, it need not be thought that the relevant perceptual experience must thereby have a negative representational content. Rather, in having conscious perceptual contact with regions

of space and intervals of time within which positivities can be perceived, a subject also has contact with regions outwith those positivities, locations at which absences are housed and extended, and in virtue of which the boundaries of such positivities are perceived. In the case of perceiving bounded objects, then, they are seen as bounded in virtue of seeing the empty space that surrounds them.

Now, critically, as Soteriou indicates, the space with which a subject has perceptual contact is *itself* a positivity – it is something. Still, *when* it is ‘empty’, it is ‘empty’ because objects are absent at those locations. This explains, then, why seeing bounded objects involves absence perception – it involves seeing the absence of objects outwith those bounds. As I explained, this is understood by Soteriou to involve a structural feature.

Recall: Where a subject’s perceptual experience has the phenomenology that her visual field is bounded, the subject is implicitly aware of her sensory limitations – she is aware that there is more to be sensed than is currently sensed. And in having such a sense, she has a complicit awareness too that for objects *to be seen* they must fall within the boundaries of the visual field. Hence, space is seen as empty (in a ground sense) when a subject is consciously aware of a region of space at which there are *no objects to be seen* but where objects could be seen. As I have indicated, this treatment involves establishing a synchrony between empty space in a ground sense and empty space in an absolute sense, at least so far as our naïve category ‘space’ is concerned (see Chapter One). When a subject is aware of empty space in a ground sense, she is aware too of the space with which she has perceptual contact as a sub-volume of a larger space. In this section I aim to show that this synchrony is established by treating the perception of empty space as a species of absence perception.

Soteriou gestures at the Kantian spirit of his proposal:

“Much of what is being proposed here echoes some remarks that Kant makes in the metaphysical expositions of space and time in the *Transcendental Aesthetic*, where Kant marks a distinction between the ‘matter’ and ‘form’ of appearances, and argues that space and time are ‘pure forms of sensible intuition’... I suggested that in vision, any region of space we perceive is perceived as a sub-region

of a region of space that has that sub-region as a part. I suggested that in explaining this aspect of the phenomenology of visual experience we should appeal to certain structural features of conscious visual experience". (ibid., p. 201)

Here Soteriou emphasises the 'formal' features of visual experience that are involved in seeing space in general. But by contrasting matter and form in this Kantian sense, it might be wondered whether it is in fact a *transcendental condition* on the possibility of seeing empty space, understood in a ground sense, that a subject must experience her visual field as bounded. One reason why such a condition might be imposed is the assumption that perceiving empty space is a species of absence perception. For on this assumption, it might be thought that a subject *cannot* appeal to the content or matter of experience in order to explain what is involved in seeing empty space. After all, if there are no objects to see, *there is no such content*.

Now, on the direct account I am advocating, empty space is seen when objects are seen through it, where the way it appears depends on its shape. But, as such, what explains the relevant seeing is not the form of the experience but its content or 'matter' – the region seen through and, as I explained in Chapter Four, its intrinsic character.

To be clear, then, the Direct View I am exploring can resist the supposition that it is a transcendental condition on perceiving empty space that a subject must experience its visual field as bounded; all that is required is seeing through. Still, it remains the case that as a piece of *descriptive* phenomenology – that is, as a description of how things seem to us – the Structural View should be embraced. As such, the Direct and Structural Views may be compatible, even if the assumption that might be thought to underwrite the appeal to structural features is resisted – namely that perceiving empty space is a species of absence perception. In §5 and §6, I set out two reasons, sketched below, in support of this resistance.

One reason that might be thought to motivate the move to structural features is the fact that absences lack phenomenal reality. But I have argued that empty space *has* phenomenal reality – it has a look. If this is correct, then we need not appeal to the structure of experience to explain seeing empty space. We can appeal instead to the structure of space.

Second, it might be thought that perceiving space as empty *of* objects already involves seeing empty space, where perception of the latter grounds the former. If so, perceiving empty space should not be identified with seeing space as empty of objects.

I discuss both points in turn.

5.

For O'Shaughnessy, while there is no hearing of silence, the same is not true in the case of darkness. Darkness has phenomenal reality, one which is only contingently linked to the absence of light - darkness might have looked some other way. But this suggests that "seeing the dark look is *not in itself* the seeing of an absence, but is instead the seeing of a presence signifying an absence". In contrast, "hearing silence is the experienced cognitive accompaniment of an absence of experience signifying a *further* absence" (my emphasis, 2000, p. 334). It might be wondered whether seeing empty space is best analogized to seeing darkness or hearing silence – that is, whether it involves the experiencing of a presence (e.g. darkness) signifying an absence (no light), or the awareness of an absence (viz. of experience) signifying a further absence (e.g. no sound).¹¹⁵

Now, for Soteriou I suppose the answer is 'neither'. On the Structural View, seeing empty space doesn't involve the absence of experience but the experience of absence -

¹¹⁵ O'Shaughnessy does not consider the case of perceiving empty space, and it is unclear whether he would in fact advocate treating it on the model of silence. For he writes (albeit reflecting on the peculiarity of holes):

"The perception of holes is a true perceiving – but then a hole is not an absence. Even if a hole was an empty portion of space, the portion of space is not the absence of matter from that space; and in any case seeing a hole is neither a seeing the absence of matter in a space, nor seeing-that matter is absent from a space". (2000, p. 333, fn. 6)

Here O'Shaughnessy endorses a controversial line on the ontology of holes – one that might be identified with the materialist position advocated by Lewis and Lewis (1970) and sketched in Chapter Three. What is critical, however, is his observation that empty space ("an empty portion of space") is not the absence of matter from that space. This is ambiguous between two distinct readings – (i) that what we *call* empty space contains matter (dust particles say) and so is not an absence of (all) matter from that space and (ii) that empty space ought not to be identified with an absence of matter from that space. At any rate, whichever reading is preferred, seeing empty space would only be a candidate for the cognitivist treatment O'Shaughnessy advocates in the case of silence if it were *also* assumed that empty space has no phenomenal reality. Such a treatment would assume that the concept of 'empty space' is a concept of absence – just as the concept of silence is as of there being no-sound. But O'Shaughnessy does not speak to this issue.

viz. the absence of objects at locations. So it doesn't involve the experience of an absence of experience signifying *another* absence. But because it involves the experience of absence, nor is it the seeing of a presence signifying an absence, for, if it were, it is arguable that no appeal to structural features would need to be made.

In contrast, on the Direct View, seeing empty space *does* involve seeing a presence; absolute space that is seen through. As I have argued, such empty space has a certain phenomenal appearance – a see-through look. But to this extent, seeing empty space can be analogized to seeing darkness after all. Just as darkness might have looked some other way, so might empty space, and just as the concept of darkness is the concept of an appearance, so, I urge, is the concept of empty space, at least in a ground sense. Recall Emily Brontë's sketch of her writing table at the parsonage - it might be argued that the absence of pencil marks captures an *appearance*, not an *absence of something appearing*.

What's more, as I argue below and in Chapter Eight, for certain subjects such an appearance may well *signify* an absence; it may signify an absence of visible objects, namely *by* looking a certain way.¹¹⁶ But since *absences* don't look a certain way, if the Direct View is correct, perceiving empty space is not a species of absence perception, even if it is true that there are no objects at those regions.¹¹⁷

This leads to a related point:

For Soteriou, the perception of bounded objects may involve the perception of absences outwith those boundaries. The Direct View suggests a distinct way of accommodating this insight.

Smith and Varzi (2000) distinguish between two class of boundary; those that are *bona fide* and those that are set down by *fiat*. Fiat boundaries are laid down by normative practices that depend on human beliefs and practices - for example, the equator, or the

¹¹⁶ Soteriou, though agnostic on the metaphysics of space, seems to embrace a similar perceptual ontology. The space of perception is, he argues, a *positivity* - something that can be filled or is empty at regions.

¹¹⁷ Hence, we visually 'register' the absence of visible objects by seeing see-through empty space. Such space *is* empty of visible objects, but we don't perceive it *as* empty. We just see it.

border of China – while bona fide boundaries involve either spatial discontinuity or qualitative heterogeneity. Holes, fissures, cracks and slits are stereotypical cases of the former - they are ‘gaps’ in some sort of extended material. While boundaries that involve a change in texture or material constitution are qualitatively heterogenous - for example, the boundary between the sea and sand, or cake and icing. What type of boundary does Soteriou suppose is perceived? A bona fide one surely, but which type?

Since absences lack qualities, it should naturally be denied that the relevant boundaries are perceived by perceiving qualitative heterogeneity – absences *have* no qualities. Instead, it must be insisted that spatial discontinuity is perceived, where this, it might be supposed, involves perceiving an absence of matter outwith the bounds of objects.

Now, on the Structural View, perceiving this much requires conscious perceptual contact with a region where objects could be seen but aren’t, which in turn involves the experience of the visual field as bounded; that is, as delimiting a region where objects could be seen. But the Direct View makes plausible an alternative response. Again, I take my cue from O’Shaughnessy.

O’Shaughnessy writes that “the perception of presences is not opposed to the perception of absences, but to either *not* perceiving at all or to perceiving *other* presences” (2000, p. 334). The Direct View has the resources to harness this thought.

When a subject perceives the boundaries of objects, she does so not by perceiving an absence - namely an absence of matter outwith the relevant boundaries - but by perceiving a presence – a positivity, *space*, that is empty of objects. Happily, however, this much is consistent with Soteriou and Richardson, for they likewise grant that space is a positivity. Nonetheless, on the Direct View, it remains the case that a subject sees empty regions not by experiencing her visual field as bounded, but by seeing objects through the relevant region. Yet this suggests that the direct theorist can after all allow that when a subject perceives the boundaries of objects, she does so by perceiving *qualitative heterogeneity*. I explain in what sense.

I argued in Chapters Two and Three that the shape of space, which is a quality of a given region, constrains the way it appears. But if this is correct, seeing empty space is not simply the seeing of an absence of matter outwith those boundaries, it involves seeing the intrinsic properties of a particular region. My claim is that, when such regions are seen, they have a particular phenomenal appearance, and so, in O'Shaughnessy's sense, are positivities. But this being so, even if it is insisted that the boundaries of objects are characterised by spatial discontinuity and thereby involve the presence of the absence of matter outwith those boundaries, we can still insist that the *perception* of such discontinuity involves the perception of qualitative heterogeneity in as much as it involves the perception of 'another presence' outwith those bounds - namely space with a see-through look.¹¹⁸

This completes the first part of my argument. In the final part of the chapter, I outline reasons for thinking that perceiving empty space grounds the perception of the absence of objects at those regions and so should not be identified with perceiving their absence.

6.

Soteriou's account allows us to sort among absences the ontology of which differ – we can distinguish among absences that are spatially extended, such as absentee voluminous objects, and those that are temporally extended, such as silences. Likewise, some absentees are spatio-temporal – rainshowers on a cloudless day. Call that which is absent an absentee, and the *absential location* the location in time or space that an absentee would have occupied if present.¹¹⁹ So cast, silences have

¹¹⁸ It might be objected that there is no qualitative heterogeneity in this instance since both objects and the empty regions 'outside' them are Euclidean. The curvature of those 'outside' regions then (where curvature is understood as a quality of a region) is not distinct from the curvature of the objects for which it is their 'outside'. Hence, there is no qualitative heterogeneity. My claim, however, is that the relevant heterogeneity is phenomenal, and, in this sense, is qualitative. There is a visual phenomenal or qualitative difference between seeing empty regions and opaque objects

¹¹⁹ The thought that absentees have absential locations is developed in the Indian philosophical tradition known as *Vaiśeṣika*. An absence has an absentee and also a location and time. Hence 'x does not occur in y at time t' is recast as 'an absence-of-x occurs in y at time t' (see Ganeri 2001, p. 82). Notably, the relation between absences and their locations is distinct from that between presences and locations.

absential locations in time, while absentee objects have absential locations in space. I suggest we might use this idiom as a way of recasting the structural analysis.

On the Structural View, when a subject experiences her visual field as bounded, she is implicitly aware of a region within which objects could be seen were they to fall within that region. On these grounds, the subject is visually aware of locations at which *no* objects can be seen but which, were objects to occupy those locations, would be seen, namely by falling within the relevant bounds. Hence, in being implicitly aware of her sensory limitations, a subject is attendantly perceptually aware of absential locations for absentee visible objects.

Now, *prima facie* it might be thought that, in being perceptually aware of absential locations for absentee visible objects, such a subject is thereby aware *only* of empty regions – regions at which visible objects are absent. But critically, spatially extended absentees may also have absential locations *at regions that are occupied* – the region at which Pierre is absent might be filled by Sartre. But in this sense, perceiving the absence of objects at locations is distinct from perceiving silence. How so?

When you perceive silence at a time, you have perceptual contact with an interval of time within which sound could be heard but isn't. But when you perceive the absence of an object at a location, it need not be the case that no object is seen at that location (in the way that no sound is heard when one 'hears' silence), for *another* object may be seen there. Hence, to generate the structuralist parallel between silence and empty space, it must be insisted not that particular objects or kinds must be absent from those regions, but that *any* visible stuff or material is.

Now, at the outset of this thesis I noted that seeing no thing does not yet entail that *nothing* is visible, for empty space may be visible. Must the structuralist conversely insist that where no thing is visible at a region at a time *that nothing is visible*? I suggest one reason for denying this entailment.

Only the latter involves contact for example (*ibid.*, p. 87). See also Matilal (1985, p. 145). I thank Dan Arnold for email correspondence on absence perception in Indian philosophy.

The structuralist may wish to preserve the possibility of sorting among *two* species of empty region that may fall within the space the visual field delimits at a time - regions where objects *would be seen* were they to occupy those regions, and regions where objects *wouldn't be seen* were they to occupy those regions, namely because *other* opaque objects would occlude them – for example, the empty region behind the unopened door that Percival fails to occupy.¹²⁰ Call the former unoccluded empty regions.

Now, it might be insisted that unoccluded empty regions are *simply* those where, if objects were located there they *would* be seen. On such a view, it might be thought that we should thereby *identify* unoccluded empty regions with the possibility of absentee visible material being seen if only it were present at those locations. Critically, such an understanding harnesses a *relative* sense of being empty – empty space is space that is empty of visible objects. As I noted at the outset, however, I am mostly interested in perceiving empty space in a *ground* sense – space that *is* empty of visible material but which, if I am correct, we don't tend to conceptualise *as* empty, either in a relative or comparative sense. Rather, as I have indicated, the concept of such empty space is best understood as an *appearance*. We can harness O'Shaughnessy's idiom as a way of characterising this difference: While the concept of empty space in a relative sense is a concept of absence, the concept of empty space in a ground sense is the concept of an appearance. In Chapter Three I provided an argument for the empty space in our vicinity having an appearance.

Now, the structuralist understands “empty space” as space at which visible objects are absent, and which is thereby “empty” in a relative sense. But need a structuralist

¹²⁰ Here I should offer an explicit gloss on the notion of the visual field as understood by the Structuralist. First, visual experience is said to have a ‘field’ since we are aware of its boundaries or limits. Second, as Richardson urges, it does not have a field character because things appear to us ‘from somewhere’ – saying that visual experience has a field is not to say there is an origin present in visual experience, but that it has the above character (2010, p. 232). Third, the field is invariant because it is characterised in terms of these structural features. Hence, even though different regions of space are delimited at a time, no region is identified with the ‘field’ of vision. Fourth, and importantly, the space the field delimits is not everything that is seen at a time – it also contains unseen regions (such as the empty space behind the closed door that Percival fails to occupy). This view follows M. G. F. Martin. As Richardson writes: “As Martin makes clear in his account, the visual field includes regions of space at which nothing is currently seen due to occlusion (1992, p.199) or darkness (1993, p. 214).... On Martin's view, with my head in a closet, my visual field does not dwindle...The visual field includes the spaces and objects beyond the walls of the room and even the building I am in” (2010, p. 233).

analysis preclude a treatment where the concept of empty space is the concept of an appearance? It seems to me, the answer may be ‘no’ (though naturally I defer to the structuralist).

The structuralist treats empty space as “empty” in a relative sense, perhaps because of the dialectical opposition to O’Shaughnessy’s treatment of silence perception. As I have tried to establish, this may also explain why, on a structuralist treatment, the notions of empty space in *absolute* and *ground* senses are thereby brought into synchrony. Since empty space is understood relatively as the absence of visible objects, there is no *content* to appeal to, hence the requirement to engage structural features as explanatory. But this explains why a concomitant conception of *absolute* space must be adopted – when a subject experiences her visual field as bounded, she experiences the space delimited by those bounds as a sub-volume of a larger space that has that space as a part.

The structuralist solution, then, is to treat empty space in a ground sense *as* relative absence: it is urged that a subject perceives the absence of visible objects when she has conscious perceptual contact with regions where objects could be seen, i.e. by falling within the bounds of the visual field, but where objects are not seen. As I have suggested, however, this does not yet distinguish between *two* types of empty region where objects could be seen, namely by falling within the bounds of the visual field, but where objects are not *currently* seen – empty regions that are occluded and unoccluded empty regions. Yet since structural features are ubiquitous in experience, they cannot sort among these regions.¹²¹

As both Soteriou and Richardson note, it is an *invariant* feature of the phenomenology of visual experience that we experience our visual field as bounded. But as such, the boundaries of the visual field are present independently of whatever objects fill the

¹²¹ It might be objected that there is a natural way to accommodate occlusion on the Structural View: an occluded object would be seen without any changes in the visual field if other objects in the space the field delimits at a time were moved, while objects that are outside the visual field cannot be seen by rearranging objects (Thank you to Matt Nudds for emphasising this point). I maintain, however, that there is a *phenomenal* distinction we can mark between unoccluded empty regions and regions occupied by opaque objects *at a time*. And arguably this is what helps sort among *which* rearrangements would bring unseen objects and empty places into view – viz. those that ‘clear the occluding ground’ in the appropriate way.

relevant sub-volume delimited at a time (and hence, which empty regions are occluded or unoccluded at a time). Indeed, as Soteriou notes, they are present independent of *any* objects or empty regions being seen:

“In virtue of its possession of a spatial sensory field, in vision our conscious visual contact with a region of space, of limited extent, within which objects can potentially be seen, does not depend on our actually seeing some object occupy that spatial region. And arguably, it does not depend on our being causally affected by objects, or light, that fall within that spatial region. If no objects and no light are seen to fall within such a spatial region, we see the darkness that fills that limited region of space”. (2011, p. 199)

This brings into view where the Direct and Structural Views diverge, at least insofar as seeing empty space is concerned.

On the Direct View, an empty region is seen when an object is seen through it; this requires the presence both of objects and of light. In contrast, on the Structural View, empty regions are perceived when a subject is visually aware of regions at which no object is seen, but where objects would be seen were they to occupy those regions.

Now, naturally, what is required *for being seen* is being somewhere in the region the visual field delimits. But as I have explained, not anywhere in the region will do. To be seen, a visible object must fall within a region not yet occluded by other opaque objects. How might the structuralist sort among occluded and unoccluded empty positions?

Two possibilities seem open.

It might be suggested either that we treat the perception of unoccluded empty regions phenomenally, or that we treat their perception in phenomenalistic terms. For example, it can be argued either that we see unoccluded empty regions because they have an appearance *that we see* (as I have argued by seeing through them), or we can identify such regions with the possibility of an object being seen were it to be located there and, hence, the *perception* of those regions with the perception of the possibility of an object being seen if it were so located.

The first position is that advocated by Direct View and, as I have suggested, it remains consistent with the descriptive phenomenology of the Structural View. But this being so, it can nonetheless be allowed that *when* we are in conscious perceptual contact with regions where visible objects are absent, we are in conscious perceptual contact not with the possibility of objects being located there (indeed it is difficult to appreciate what such *perceptual* contact would involve), but with the *grounds* of those possibilities – the empty space that objects could thereafter take up.

The Direct View argues, however, that we *see* those grounds, namely when we see the see-through look. But, critically, on such an understanding, seeing empty space is no longer a species of absence perception. Rather, as I explain in the closing section, seeing empty space grounds the ‘perception’ of the absence of objects at locations. But, as such, seeing empty space shouldn’t be identified with seeing their absence. I elucidate this thought by returning to the attitudinal take on the ontology of absence with which I began.

7.

O’Shaughnessy considers the nature of the experience involved in seeing an anonymous letter:

“Instead of the expected signature at the end of letter you see blank white paper: you say, ‘I saw that there was no name.’ This reports an experience of absence, which... happened as you saw, and registered the presence of, a pure expanse of white. Then could this experience of absence be identical with the seeing of the white? Now the white, being no more the absence of a name than (say) of a drawing (or a rhinoceros!) cannot be identified with the absence of a name: after all, the white is something and the absence is nothing. So how could the seeing of one *be* the seeing of the other? And yet the white can be visually experienced *under a negative aspect*, for example as *not being a name-bearer*... Could such a negative mode of experiencing white *be* the experience of seeing name-absence? But seeing name-absence is a seeing-that something is missing, whereas the aforementioned negative experience is the seeing-of a presence *as* endowed with a negative property. In a word, seeing the absence neither is, nor is it a mode of, seeing the white”. (2000, pp. 329-330)

I suggest the same analysis should apply to the seeing of empty space *as* empty of visible objects. This is so in the following sense:

When a subject sees the see-through look, though she sees a region *at which* there are no objects, she does not see the region *as* empty of visible objects. Rather, when she apprehends the latter, she does so *because* it sees the look (it might be urged that this is what the *visual* registration of an absence amounts to). Similarly, O'Shaughnessy holds that the seeing of the absent signature is 'occasioned' by catching sight of the white. But as such, the seeing of the white and the seeing of the absence of a signature are two distinct experiences:

"That is, the experience of absence is consequent upon the seeing of white in the context of an expectation of seeing a name; it is consequent upon comprehending seeing of white as a pure expanse of white. In short, a directly experienced causal relation links the two experiences. Thus, the visual experience causes the experience of absence, which is in addition directly given as arising out of the visual experience. The experience of seeing the absence of *X* is the coming-to-know-of-the-absence of *X* (directly given as arising out of a present visual experience of what shows no *X*). This cognitive experience is such that we experience the visual object *as* a presence endowed with a negative property. For example, we see the pure expanse of white *as* an unsigned-upon white expanse, as (so to say) bereft in a certain regard". (ibid.)

This echoes the metaphor that has guided my elucidation of the notion of empty space in a ground sense throughout – the notion of a sketch. I can now make my proposal fully explicit. A lack of pencil-markings need not represent an absence but may rather represent a positivity that in turn *signifies* an absence.¹²² Likewise, just as the seeing

¹²² Cf. Molnar's (2000) dispute with Taylor (1952). Taylor argues that the absence of the dot in the circle on the right can, like the presence of the dot in the circle on the left, be directly and non-inferentially perceived.



Molnar suggests, however, that while the latter can be non-inferentially perceived, the same is not true in the former case. He writes that while there is nothing available on which to ground the relevant inference in the former case, "there *is* something from which we can infer the circle's being empty of dots... namely, the perception of the circle and the failure to perceive the dot" (2000, p. 80). In contrast, I urge *with Molnar* and against Taylor that the perception *of the absence of the dot* cannot be non-inferentially perceived, but I nonetheless claim *with Taylor* and against Molnar that the empty region, here understood as a presence that signifies an absence, *can* be directly non-inferentially perceived. One can infer the absence of the dot not from a failure to experience anything, but by

of the white is not to be identified with the absence of a signature, seeing empty space and seeing it as empty of visible objects are distinct. I suggest that this provides the resources for dissolving the dispute with which I began.

When Sartre notices that the café is “bereft” of Pierre, he supposes:

“This does not mean that I discover his absence in some precise spot in the establishment. In fact Pierre is absent from the whole café; his absence fixes the café in its evanescence; the café remains ground; it persists in offering itself as an undifferentiated totality to my only marginal attention; it slips into the background; it pursues in nihilation. Only it makes itself ground for a determined figure; it carries the figure everywhere in front of it, presents the figure everywhere to me.” (1969, p. 42)

Here Sartre insists that Pierre’s absence is not discovered “in some precise spot in the establishment”. Rather, where Pierre is absent is *the whole café* - in the idiom I introduced earlier, the absential location is the café at large. But surely we should want to say that Pierre *is* absent, not only from the café, but from all its sub-regions too - after all, Pierre’s absence is an objective state of how the world that comprises the café, including its sub-regions, is. How, then, can Sartre suppose otherwise?

I suggest that we can do justice to Sartre’s intuition while nonetheless granting a non-attitudinal take on the ontology of absence once we allow that we can distinguish between ways in which *absential locations* are individuated. In the passage above, the place at which Pierre is absent can be individuated both intensionally and extensionally. Read intensionally, what counts as the relevant absential location is whatever region it is at which Sartre might have expected Pierre to appear. In this instance, the boundaries that demarcate the relevant absential location - viz. that pick out *which* absential location is relevant - are *fiat*. That is to say, they depend, for their individuation, on some attitude. Individuated extensionally, however, *which* spatio-temporal regions are bereft of Pierre is just an objective matter. Hence, *perceiving*

experiencing the empty expanse that grounds an apprehension of the absence of the dot. Cf. Richardson (2010, p. 230) and Sorensen (2008, pp. 247-248).

Pierre's absence is simply a matter of perceiving *any* region at which Pierre is absent, and this is so independently of any expectation that Pierre would be seen.¹²³

For those theorists that treat the perception of empty space as a species of absence perception then, it seems apposite to ask: Which analysis is intended - intensional or extensional? Naturally, were an intensional analysis applied to the perception of empty space, it would have to be supposed that, just as Sartre must look for Pierre in order to perceive his absence, to perceive empty space a subject would have to look for, and fail to see, visible objects at certain regions – viz. those the relevant episode individuates. Such an account would be attitudinal since would it depend on the presence in the perceiver of a psychological episode with 'no-thing' figuring in the content (viz. 'no thing is there'). In contrast, on an extensional analysis, seeing empty space simply involves seeing regions at which visible objects are absent. I take it that this is the analysis the structuralist favours.

As I have outlined, both Soteriou and Richardson explain such seeing by appeal to the structural features of visual experience, thus suggesting that a propositional account of seeing empty space can be resisted. In this chapter, however, I have provided an alternative means of resistance. I have argued that even while we can grant that seeing empty space involves seeing regions that are empty of visible objects, we should explain such seeing in terms of the matter or content of experience – the space in which the subject is and which she sees through. But for this reason, I have likewise argued *against* treating empty space as a species of absence perception, here taking my cue from O'Shaughnessy's reflection on the perception of darkness.

Since absences are nothing, they lack perceptible properties. But as such, the 'perception' of absence must be grounded in the perception of some positivity – one that signifies absence. In the case of empty space, I have argued that seeing the look grounds the 'perception' of the absence of objects at certain locations. But this being so, I thereby favour an *intensional* account of the 'perception' of space *as* empty of visible objects. On my view, 'perceiving' the absence of visible objects at certain

¹²³ Note absential locations so individuated have dimensions – they are the size of the region that the absence would have taken up if present. In "Blanks" Sorensen notes: "The size and location of a blank is just the size and position of the character position" (1999, p. 310).

locations is grounded in, and occasioned by, the perception of empty space, itself a distinct and non-epistemic experience. But as such, just as seeing empty space does not involve looking for nothing, nor is it exhausted by the seeing of no thing at regions where something could be seen.

I return to this distinction in Chapter Eight. I argue that one can see empty space by seeing the look without seeing empty space as something that objects could take up. This in turn helps clarify further where and in what sense the Structural View and the direct account diverge, even while at the level of descriptive phenomenology they can, I think, be happily reconciled.

in nuce:

In this chapter, I have argued against treating perceiving empty space as a species of absence perception. Since empty space is empty of objects, it might be assumed that it lacks phenomenal reality. However, because I have motivated absolutism as an assumption (Chapter One), and since I have argued that even Euclidean space has a look (Chapter Three), I reject this view.

What's more, I have tried to explain why we need not thereby embrace a Structural View, one which requires that a subject have an implicit sense of her sensory limitations in order to perceive empty space. Since the direct account I am urging appeals to the content of experience (Chapter Four), not its form, a subject can perceive empty space without having the phenomenology that her visual field is bounded.

In the chapter that follows, I touch on the tactile – just as seeing empty space is not a species of absence perception, nor, perhaps surprisingly, is ‘touching’ it.

Touching Empty Space

His thigh bones and shoulder blades are scales
That a speck of dust could tilt

- Michael Longley, *Oliver Plunkett*

In Chapter Three, I explained why the look of empty space is apt to go *overlooked* – it looks see-through. Still, empty space is seen. Here I make a case for tactile perception. I suggest that there is no tactual sensation associated with ‘touching’ empty space; this is insofar as when, as I will argue, we ‘touch’ empty space, we don’t undergo an experience of contact. Still, just as empty space has visible properties, so, I suggest, it has tactile properties that we are tactually aware of through (in a sense to be explained) bodily awareness and sensation.

Here is how I aim to proceed. In §1, I set out an argument offered by Nerlich for the claim that *non*-Euclidean empty regions can be felt. Like the visual case, however, Nerlich denies that Euclidean empty regions can be felt – such regions are not felt, he claims, since we do not *notice* feeling them. In §2, I outline M. G. F. Martin’s ostensibly contradictory claim that space outwith the body is unfelt, and I show how once the notions of feeling, read in a bodily sensation sense, and feeling, read in a perceptual sense, are distinguished, the appearance of contradiction vanishes. I suggest there is a way of reading Martin’s account that is compatible with the claim that empty space can be ‘touched’, even in the Euclidean case (§3). In the final part of the chapter, I develop this claim by explaining how the notions of felt resistance and contact come apart. In §4, I chart the possibility of touch without felt resistance; here I appeal to the taxonomy of tactual phenomena sketched by David Katz in *The World of Touch*. And, in §5, I consider a peculiar case of touch without the experience of contact – the experience of touching something with a numb hand. This brings into relief the thought that, although there is no tactual sensation associated with ‘touching’ empty space, at least on the model of contact, we can nonetheless enjoy

tactual awareness of empty space even in the Euclidean case, where no resistance is felt. I close by noting some objections (§6).

1.

Paradigmatic cases of touch involve contact; I feel the book in my hand, someone's fingertip on my shoulder. Likewise, they tend to involve resistance; as when I try to push open a heavy door, or walk against the wind. Sometimes experiences of contact have a punctual quality - as a knock on a door has. Indeed, in reflecting on experiences of contact, we may think, not of the *fact* of contact or even the *relation* of contact (such as there is when you hold someone's hand, or run your fingers across velvet), but rather the *moment* of contact, the event whereby something is met with in touch, perhaps bumped into.

With such cases in mind, it is hardly surprising, then, that we might be inclined to dismiss the claim that we 'touch' empty space. Empty space is surfaceless; it has no sides. But as such, there is no contact experienced, no resistance felt.

In this chapter I aim to show, again prompted by metaphysics, that there are reasons for thinking that untutored reflection misguides us here. There is, I argue, a genuine sense in which we enjoy tactual awareness of empty space.

In Chapter Two, I outlined the thought, defended by Nerlich, that, like Putnam's peg and the hole it fails to fit, there are some parts of space that have shapes that impede the passage of matter through them or which, depending on the convolutions of the region, require that the relevant material change shape so as to 'fit' through them. The analogy I drew was with an ill-fitting garment: a jumper may have to stretch to accommodate the girth of someone, or sleeves that are too long may wrinkle at the wrists and have to be rolled up. Likewise, matter may have to change shape to take up paths in space that are peculiarly curved.

In *Time and Space*, Dainton imagines an attempt at trying to pass some matter – in this case a cube of foam - through such regions:

“Like light rays, moving particles follow geodesics unless acted on by a force. Suppose you take a sizeable cube of soft foam rubber and move it into the hole. What would happen? Would it pass freely through? There are no material barriers to prevent it, just air and empty space. In fact, you would very likely feel a resistance. On entering the hole, the particles in the rubber will follow geodesic paths, and so initially they will converge then diverge. But this convergence will be resisted by the inter-particle bonds: you can imagine these electromagnetic forces as akin to elastic bands connecting the particles; as the particles try to converge, the bands have to stretch. Consequently, for the rubber cube to succeed in entering the hole a force needs to be supplied – to stretch the bonds – and hence you feel resistance when pushing the cube forwards”. (2001, p. 222)

I spell out this idea.

Dainton imagines that the valency that binds the particles that constitute the rubber are ‘elastic’. To pass through the relevant region, then, the interparticle bonds would have to contract and stretch, which would require the application of force. Hence, if you were to attempt to force the cube through such a hole, you would feel resistance. We might think of the resistance felt as akin to that experienced when biting into an apple or treading on hard, wet sand – it may be experienced as exerted from without. Still, unlike the apple and sand, we explain its specific character not by appeal to the material constitution of that moved through - after all, space is immaterial - but to the shape of the relevant region.

Of course, our bodies are material too. But this being so, we might wonder: Does the same thought apply?

Dainton supposes it would, and not only would we feel the relevant resistance exerted from without in such instances, we would feel it also from *within* – “since stress tensions would be generated among your middle parts you would feel a distinctly queasy sensation” (ibid.). Nerlich, to whom this idea can be traced, provides a

different analogy. In palpating non-Euclidean contours, one would, he ventures, *ache*:

“Helmholtz showed that only spaces of constant curvature permit free mobility; that is, if the space is variably curved then a thing would have to change shape in order to move from one region to another of different curvature. It would not be freely mobile... Since we ourselves are reasonably elastic, we could move about in a space of variable curvature, but only by means of distorting our body shapes into non-Euclidean forms. We would have to push to get our bodies into these regions, for only forces will distort our shapes. If the curvature were slight, the rheumatism might be easy and bearable; if acute, fatally destructive, just as if you fell into a black hole. Let us suppose that the changes are noticeable and the effort to move into the hole perceptible too. Then we could *feel* non-Euclidean holes. They would be more or less obstructive, some of them downright barriers to progress. We could palpate their contours and ache with the pressures of keeping our hands in the parts of deepest curvature”. (1994, p. 39)

Just as we can see non-Euclidean holes, so, it seems, we can feel them. What, though, of the Euclidean case?

At times, Nerlich seems to allow that we do perceive the “bland symmetries” of the space in our vicinity (for example, *ibid.*, p. 40). But in the passage above he gestures at a distinct entailment. He supposes that we could only be credited with feeling empty space were we to *notice* the bodily changes involved in palpating non-Euclidean regions (“Let us suppose that the changes are noticeable and the effort to move into the hole perceptible too. Then we could *feel* non-Euclidean holes”). *Noticing*, then, is a condition on feeling. I aim to undermine this thought, and specifically in the Euclidean case. I argue that we do experience the tactile properties of empty space in our vicinity but that, just as the look of space is apt to go overlooked, we do not notice the tactual awareness that we thereby enjoy. My strategy is to consider the account of bodily awareness and touch offered by M. G. F. Martin.

I begin by considering Martin’s ostensibly contradictory thought that space outside the body is *unfelt*.

In reflecting on the structure of bodily awareness, Martin provides the following instruction:

“[C]onsider one’s sense of the relative position of parts of one’s body. If one extends one’s arms out in front of one, one has a sense of the position of both hands, and their positions in space relative to each other. No part of one’s body occupies the region of space lying between the two hands; and it does not feel to one as if any part of one’s body is there. One does not have, therefore, in position sense any awareness of what occupies that region of space, if indeed anything does. Nevertheless, one does feel one’s hands to be separated across that region of space. In this way regions of space which extend beyond what one feels at a time through bodily awareness enter into the character of how one feels things to be through bodily awareness. What one feels in this way is felt to be located in a larger space which one does not also feel. Since one is aware of nothing but one’s body, it does not have to be identified as such within experience; there are no other objects of awareness to contrast it with. But since one is aware of it as in a world which contains many other objects, one nevertheless has a sense of it as one’s body in contrast to other objects, things which one doesn’t feel”. (1993, pp. 212-213)

Martin’s thought in this passage is that bodily awareness is experienced as bodily only when a subject experiences her body as occupying a space that extends beyond it. Such space is, we might say, unfelt space. Space, then, enters into the character of bodily experience as bodily since, in experiencing bodily sensation as *within* the body and hence - as I am using the term - as *bodily*, a subject experiences its body as bounded and limited and so as occupying a space that extends beyond it. This space, as Martin emphasises, *is not felt in the same way*.

Here, the idea is that in order to experience the body as bounded, a subject must be aware of space outwith that boundary. But naturally, space outwith the body cannot be experienced *through* bodily awareness. Martin’s insight is to urge that although it might be supposed that the sole object of bodily awareness is the body, for a subject to be aware of her body *as her body*, she must also be aware of space outwith the body. And this is because to experience sensation as ‘within’, she must have a sense

of there being a 'without' – a world that extends beyond the limits of sensation, and in terms of which those limits are drawn.

Two points require special emphasis.

First, it shouldn't be thought that through bodily awareness, the boundaries of the body are thereby felt to be determinate.¹²⁴ Consider the awareness you have of your nose. It is not the case that by sensing it from within you feel it to have any particular shape. Martin's point is not that through bodily awareness the boundary of the body is itself experienced, but rather that, if a subject experiences its body as bounded, then it is concomitantly aware of a region that extends beyond it.

Second, Martin aims to suggest, on the basis of this observation, that the structure of bodily awareness and the structure of visual awareness are distinct. Unlike bodily awareness, the objects of vision and the space in which they are located, including empty regions, are experienced in the same way. Take his parade case, which I quoted earlier:

"Consider the case of looking at a ring-shaped object, a Polo mint, for instance, head on. One is aware of the various white parts of the mint arranged in a circle and aware of how they are related to each other. One is also aware of the hole in the middle of the mint, and that that hole is there in the middle. If one was not aware of the hole one would not see the mint to be a ring-shape rather than a circle. Nothing need be perceived to be within the hole. One is aware of the hole as a place where something potentially could be seen, not as where something is actually seen to be.

So we can think of normal visual experience as experience not only of objects which are located in some space, but as of a space in which they are located". (1992, p. 199)

Here, Martin suggests that we are visually aware of objects and empty space in the same way, where seeing 'empty space' involves seeing a location where something could be seen but isn't. This feature of visual awareness contrasts with the bodily case in the following sense.

¹²⁴ Notably, the bodily boundaries of the subject can be prosthetically enhanced. I overlook this complication.

In bodily awareness, the space *in which the body is* cannot be experienced as *bodily* for otherwise we would lose the contrast in terms of which the boundaries of the body as bodily are drawn (i.e. whereby sensation is experienced as 'within'). Martin's strategy, then, is to reveal, by analogy, a *dissimilarity* between visual and bodily awareness, one that he also casts as 'structural'.¹²⁵ This runs as follows:

In vision, empty spaces are visually experienced in just the same way as objects are – both fall within the bounds of the visual field. But in contrast, we are not aware of *the space in which the body is* in the same way we are aware of the space the body occupies. The limits of the bodily field are such that space outwith the body cannot be felt in the same way – viz. bodily.

This analogy is, it seems to me, acute. Still, we can point to a disanalogy between the two cases, the force of which is perhaps obscured by parallels Martin elsewhere elucidates between bodily awareness and touch.

In the visual case a comparison is drawn between objects and empty space, while in the bodily case the contrast is between bodily space and space outwith the body – unfelt space. As noted, space outwith the body is 'unfelt' insofar as it is not experienced as bodily. But as such, the term 'unfelt' applies indiscriminately to whatever is outwith the body, and so is neutral among unfelt objects and empty spaces. This makes tempting a extrapolation from Martin that is relevant to our dialectic and which, as I will explain, is mistaken.

For Martin, bodily sensation is not entirely subjective – *qua* bodily sensation it has a felt location, namely *within* the body. It is this feature of bodily awareness that Martin suggests provides for touch:

¹²⁵ Nudds (2001, p. 213) notes a structural dissimilarity with the case of sound: "In the case of vision, we can distinguish between having an experience of their being nothing at a place where we could experience something, and not having an experience of anything in a place we could experience something; between that is, being aware that nothing is there and being unaware of anything there... it is this visual awareness of places where there is nothing, which has no auditory equivalent. We are simply not auditorily aware of empty places – there's no difference between not experiencing a sound at some place, and experiencing no sound there". Here the point is that in visual experience we can have visual awareness of places where there is nothing to see. But in auditory experience we cannot have auditory awareness of places where there is nothing to hear.

“We are embodied in a world which contains potentially many other bodies. We can come into contact with other bodies, and they can impede our movement and distort our shape. Such physical impingement on us is reflected in the awareness we have of our bodies. One is aware when one’s movement is impeded, and when one’s skin is in contact with objects or is distended by them. In being aware of one’s body, sensing how it is disposed, where it can and can’t move, and where one has sensations, one can attend to the objects in virtue of which these are true. One measures the properties of objects in the world around one against one’s body. So in having an awareness of one’s body, one has a sense of touch”. (1992, p. 203)

It worth noting just what ‘bodily awareness’ is for Martin. Critically, it means to pick out “the various ways in which we are aware of our own bodies”:

“At present I am aware of my posture, orientation in space, the position of my limbs; I have some sense of the shape and size of my body, and within and on it I am aware of various goings on – itches, aches, patches of warmth”. (ibid., p. 201)

Through bodily awareness, then, not only are bodily sensations felt to be at some monadic objective location within the body, they are also felt to be at some location relative to other parts of the body. But this also involves the contrast that Martin urges, namely between sensation felt to be within the body and unfelt space without. After all, it is not the case that, when you feel parts of your body to be related, you feel them to be related *through parts of your body*. Rather, as Martin writes, you feel them to be a certain distance apart *in space extending beyond the body*. Feeling bodily sensation to be at some objective location within, then, is attendant with a sense of how the body is disposed *in space*. And it is this awareness of how the body is disposed that provides for the sense of touch. I spell out this thought.

When your body touches an object, say when your finger touches the rim of a glass, the place where you feel the sensation to be and the part of the object that presses against your finger share a common spatial property; in veridical perception they are at the same location in space. Hence, the sensation, in having a felt location, can provide an awareness of the location of the object that impedes the movement of your finger. But this being so, bodily sensation is constitutive of, and grounds, tactile perception. Importantly, however, it should not be thought that the bodily sensation

and the tactile perception are thereby distinct states of mind.¹²⁶ Granted, when you touch an object, you can attend to the location of the sensation felt *or* to the object touched. But in both instances it is the same state of mind that is attended to, albeit in different ways. This is often glossed in terms of ‘bipolarity’. Touch is said to have two poles as a function of awareness. When you attend to the sensation in your hand (say), the object touched recedes into the background of awareness - what is foregrounded or ‘stands out’, rather, is the bodily sensation. In contrast, when you attend to the object touched the body seemingly becomes ‘transparent’ – it becomes the medium through which the object felt is felt.¹²⁷ In the latter case, writes Martin, one perceives something “lying beyond the body but in contact with it, so that the spatial character is that of the location of whatever it is which connects with and impedes the movement of one’s body” (ibid., p. 204).

Now, here I have provided a somewhat atomic example of tactile perception, one whereby a finger touches a single point on a glass. Martin’s emphasis, however, is on more *molecular* cases, those involving contact at more than one point on the body. Below he considers the experience of touching the rim of a glass with all five fingers:

“When one grasps the rim one comes into contact with it at only five points, where one’s fingertips touch it. Nevertheless one comes to be aware that the glass as a whole is circular”. (ibid., p. 200)

In this instance, the awareness a subject has of the arrangement of her body is attendant with an awareness of the shape of the object touched outwith the body. It is in this sense that, as Martin writes elsewhere, the body acts as a ‘template’ with which objects in the world, and their properties, can be perceived. This, then, is his ‘template’ model of touch. But the claim that bodily awareness grounds and is partly

¹²⁶ In his reflections on intersubjectivity, and elsewhere, Husserl develops a similar phenomenology. But, given his transcendental motivation, his conclusions are somewhat different. For example, Husserl also thinks that tactual sensation can be thematized as an objective property of the object touched *or* as a non-objective property of the experiencing organ, say the hand, and, in both cases, the sensation is localised as occurring in the same place. Nevertheless, localising sensation in this way is not sufficient for the objectification of the body. The body is originally given as a volitional structure (an ‘I can’ or an ‘I do’) and to merely localise sensation is not yet sufficient to suspend (or better sublate) subjectivity so as to constitute the body as an *object* in the world. Rather to constellate the experienced body (*Leib*) as objective (*Körper*), one has to be confronted with the bodily appearance of another (see Zahavi 2003, pp. 98-125).

¹²⁷ Leder (1990, p. 17) describes this as an “uncertainty principle of embodiment” – we cannot perceive the body and what is perceived with it at the same time.

constitutive of tactile perception has a further important consequence: the structural difference uncovered between the visual and bodily case applies also to tactile perception. Compare the case quoted at the outset of this section (a) -

“If one extends one’s arms out in front of one, one has a sense of the position of both hands, and their positions in space relative to each other. No part of one’s body occupies the region of space lying between the two hands; and it does not feel to one as if any part of one’s body is there. One does not have, therefore, in position sense any awareness of what occupies that region of space, if indeed anything does”. (1993, p. 212)

- with (b) the tactile experience of the glass (the example above):

“In being tactually aware in this way, is one aware of the parts of the rim in between the points of contact in the same way as one is aware of those points, and is one aware of the region of space lying inside the rim? The answer would appear to be not: one comes to be aware of the glass by being aware of the parts one touches”. (1992, p. 200)

In both bodily awareness and tactile awareness, then, although the subject is aware of regions outwith the body, the subject does not experience such places, through such awareness, as being filled or empty.

Another example Martin uses to make this thought explicit is borrowed from Gareth Evans,¹²⁸ again developing the thought that visual awareness is distinct from bodily and tactual awareness.

Imagine viewing four points arranged in a square – say stars in the night sky. In viewing such points, you are also aware of the space that surrounds and contains them, and within which they stand in spatial relations. As an analogue, Martin asks us to consider a rock climber on a cliff face whose hands and feet are inserted into cracks in the rock such that they are arranged in a square. In such instances, although the climber may be aware that the cracks are approximately equidistant, she has no sense of what lies between them, at least not through tactuo-kinaesthetic awareness. So the climber cannot tell “whether anything is there or not” (1993, p. 216). But this contrasts with the visual case. When viewing the stars and the space between them,

¹²⁸ See Evans (1985, p. 392).

you *can* tell, by seeing a region of space in darkness, that no stars are located at those regions.

But consider now the case of the glass. When you touch the rim at five points, you have a sense, through bodily awareness of the configuration of your hand and hence of the shape of the object that you are touching, that it is circular. But like the rock-climber, you fail to have any sense, through bodily awareness, of what lies or fails to lie within the rim, which in Martin's example is empty space. And this is so even while, because one has *bodily* awareness, one is concomitantly aware of space outwith the body.

Now, it seems to me that there are two ways of reading this particular example and the phenomenology it points to. The first one I detail is Martin's, and the second is a mistaken extrapolation from the structural dissimilarity Martin excavates.

In the visual case, unlike the tactual case, you are aware, in the same way, both of objects and of locations where objects could be seen but aren't – both are visible. Cast somewhat differently, so long as they fall within the bounds of the visual field, you are visually aware of objects and locations at which objects could be seen but aren't, where, importantly, what falls *outside* the bounds of the visual field is not relevant to how things within it appear to be within it – i.e. visible (cf. the Structural View detailed in the last chapter). But this is distinct from the tactual case. A subject cannot be tactually aware both of objects touched and locations where objects could be touched but aren't. This just seems obvious. But why? Because, says Martin, tactual perception is grounded in bodily awareness, and what falls outside the bounds of bodily awareness is relevant to how things seem in and through bodily awareness – i.e. bodily. (Recall, regions outside the body cannot be experienced as bodily for otherwise the boundary between within and without – those in terms of which the limits of bodily experience are drawn and which are constitutive of the sense of touch – would collapse). This explains, then, why we cannot feel the space within the rim – if it were felt, the body would be felt to extend to that region. But since it doesn't extend to that region, that region is not thereby felt.

The above is, I hope, a fair representation of the intricate argument Martin builds. Here, however, is a mistaken extrapolation one might, on the basis of the parallels he elucidates, be tempted to draw: We are visually aware of objects and empty space in the same way. But we are not tactually aware of objects and empty space in the same way.

Now, Martin doesn't speak to this issue. Besides, as I noted earlier, the space that extends beyond the body, and in terms of which its limits are drawn (insofar as it is unfelt), is neutral among objects and empty space. Why, then, might one be tempted to draw this conclusion? For one, the examples Martin offers might seem to suggest as much – viz. comparing visual experience of a Polo mint with tactual experience of an empty glass.

Second, and more importantly however, is the following: the way in which Martin makes sense of empty space in the visual case – as regions where objects could be seen but aren't – translates somewhat peculiarly in the tactual case – viz. as 'regions that could be felt but aren't'. Naturally, given that bodily awareness *provides* for touch, a subject could not be tactually aware of such regions if they were not felt. But, as I will show, this doesn't mean that we cannot enjoy tactual awareness of empty space, and, moreover, in just the same way that we can enjoy tactual awareness of objects.

3.

In his paper "Feelings" (1951), Gilbert Ryle iterates the numerous ways in which we can use the term 'feel'. One may feel tired or melancholic. One may feel like a cigarette or that there is a flaw in my argument. A doctor may feel *for* a patient's pulse, though, perhaps because it is faint, without succeeding. When one is feeling *for*, one may *fail* to feel.

More familiarly, we 'feel' sensible qualities, for example, the softness of velvet or the roundness of the ball, as well as itches, pains, tickles, and so on. This latter *bodily*

sensation use is distinct from the former *perceptual use*.¹²⁹ Which sense of ‘feel’ does Martin mean to harness?

On Martin’s account, space outwith the body is necessarily unfelt for otherwise the distinction between bodily space and the space without the body, in terms of which its boundaries are drawn, would collapse. But as such, Martin’s claim only invokes feeling in a bodily sensation sense and does not entail that empty space cannot be touched. Rather, what Martin’s account urges is that tactile feeling is grounded in feeling in a bodily sensation sense. It hence flows from the account that, if it should be found that empty space *is* felt in a perceptual sense, such feeling must be grounded in bodily feeling and awareness. How might we make sense of this claim in the case of empty space?

Consider putting your finger into a glass and moving it through the empty space within. Since you experience feeling in a bodily sensation sense, you feel your body to extend to where such sensation is located. Now, since you feel no resistance to your movement, it might thereby be thought that nothing is, in a perceptual sense, felt, save perhaps the absence of some thing (say water) at that region. If so, such a thought would tally with C. B. Martin:

“The blind feel for the absence of solid impediment to their progress. The sensation of their hand or limb passing through the space that is empty of such impediment is the desired perception of absence or emptiness in a perfectly straightforward way”. (1996, p. 64)

But whether or not this is what the blind feel *for*, if the Direct View that this thesis defends is correct, just as the visual perception of empty space is not a species of absence perception (see Chapter Five), nor is the tactual case, or at least not “*in a perfectly straightforward way*”. This is so for two reasons.

¹²⁹ He writes “To feel a tickle and to have a tickle seem to be the same thing. The spoon may be sticky or my teeth may be chattering, without my feeling it (or seeing or hearing it). But there could not be an unfelt tickle” (p. 193). Hence, while velvet could feel soft, without anyone feeling it. A tickle could not feel a certain way without being felt.

First, perceiving an absence of water at a location is arguably an epistemic perception – one is tactually aware *that* the glass is empty of *water* (this follows from the argument made in the closing section of the last chapter).

Second, like the visual case, there is reason to suggest that the feel of empty space is also a function of its shape. Recall Nerlich's hypothesis that, in moving through regions of variable curvature, a subject would ache; she would ache because in attempting to move through such regions, her body would have to change shape so as to fit the relevant contours and dilations. But since the shape of a given region is an intrinsic property of that region, feeling empty space is not simply the feeling of no thing; it is the feeling of no thing at regions *that are also felt*. I suggest the template model of touch gives us a way of making sense of this claim, even in the blandly symmetrical spaces we find ourselves moving through.

On the template model, both by sensing how the body is disposed through an awareness of the location of felt sensation, *and* by having an awareness of where the body can and can't move, one can attend, writes Martin, "to the objects in virtue of which these are true" (1992, p. 203). But in this sense empty space, be it non-Euclidean or otherwise, is as much an object for tactual awareness as common-or-garden objects like bicycles and chairs. Granted, in moving through Euclidean space, no change in the shape of the body is required or occurs. Likewise, as I will explain, no effort is needed in passing through it. But this does not entail that empty space is not felt. Rather, to the extent that the body does *not* change shape and *can* move without resistance, the body is as much a measure of the space it is in and moves through as it is a template of the objects that surround it. So why did Nerlich suppose otherwise?

As I noted at the outset, when we touch something, we typically have experience of *contact* – I feel a hand brush across my cheek, my fingertips on the rim of a glass, a coin on my palm. But in 'touching' empty space, there is no experience of contact. Does this mean that empty space is *not* thereby 'felt'? In the final part of this chapter, I draw on the resources of the template model to suggest reasons for resisting this conclusion.

In §4, I chart the possibility of tactual experience without contact; here harnessing a taxonomy of tactual phenomena set out in David Katz's *The World of Touch* (1925), while in §5 I reflect on an anomalous case of feeling, in a *perceptual sense*, that O'Shaughnessy (1989) details - the experience of feeling with a hand that is, in a *bodily sensation sense*, numb.

4.

Naively, we may treat contact as involving resistance. But not all cases of contact do. Think of the contact enjoyed when a penny is placed on your palm. You do not need to exert an upward force on the coin so as to 'hold it up' – it is too light. And the coin does not exert a downward force on you (beyond the force of gravity), since you do not need to *overcome* any force so as to uphold it.¹³⁰ Likewise, there is a difference between placing your hand on someone's arm, and squeezing it; a difference of *threshold*. There comes a point where you can be said to be *actively* doing something – viz. squeezing. Take Martin's example, of your fingertips against the rim of a glass. If you rest them very lightly, no resistance is experienced. Still, if the template model is correct, you are tactually aware of the shape of the glass through bodily awareness.

Katz's notion of 'surface touch' helps capture this phenomenon:

"We experience surface touch when we feel and manipulate an object made of wood, metal, glass, cloth or other material. What is common to all of these tactual phenomena? In each case, we encounter a continuous, unbroken palpable area, which is located at the surface of and follows all the curves on the object in which it occurs... Invariably a two-dimensional tactual structure, an obstacle bounded in space, presents itself to our consciousness". (1989, p. 50)

It is worth noting how this notion contrasts with that of surface colour, later developed by Katz in the *The World of Colour* (1935). Surface colour offers, in a metaphorical sense, "resistance to the gaze" (ibid., p. 51) – one does not see through it

¹³⁰ My claim is not that there are no forces operative in this circumstance, but only that none are experienced and actively exerted.

as one does with film colour, or, as this thesis argues, empty space. Surface colour is, simply put, opaque - it is the colour that apples have (they are not transparent).

Similarly, surface touch seems to involve resistance, though *not* in a metaphorical sense. When one touches an object that one feels by surface touch, one's hand does not pass through the object. The object so felt is experienced as impenetrable. Nevertheless, as Katz urges, it should not be thought that impenetrability, a property of an object, *entails* the experience of resistance. If a surface is touched lightly, no resistance is experienced though surface touch occurs. Rather, only if pressure is increased to a certain threshold is active resistance felt. Indeed, "surface touch remains essentially invariant throughout the entire interval from where the phenomenon of resistance just begins up to where it attains its highest degree of pronouncedness." (ibid.)

Consider this thought in the context of the template model.

Martin is careful to distinguish between *two* distinct modes in which, through bodily experience, one can have perceptual tactual awareness of the external world.

First, one can have awareness of the *shape* of an object through awareness of the configuration of one's body – in such instances, one need not experience resistance.

Second, one can have awareness of the material composition of an object through the experience of the resistance felt in trying to pass through or manipulate it. For example, it is not until one applies pressure to the rim of the glass that one experiences the active resistance that indicates that one's fingers cannot pass through the rim – viz. that the glass is impenetrable.

Now, in the case of immaterial space, the situation is a little different. It is not *materiality*, but the shape of space that, in the non-Euclidean case, might be found to impede the passage of the body through it. Rather, to pass through such a region, the body would have to change shape, where, depending on its convolutions, this would, as I have explained, require the application of force; namely, whatever force would be

required to change the spatial relations in which the parts of the body stand to each other so as to ‘fit’ through. But as such, the two modes above do not come apart. The experience of resistance felt would, on the application of such a force, be attendant with a change in the shape of the body.

Naturally, though, this is *not* the case in Euclidean space. In Euclidean space, no experience of resistance is felt and no concomitant change in the shape of the body is required, which in turn explains *why* no experience of resistance is felt. But, arguably, this is what explains Nerlich’s presumed reluctance to grant that we do, after all, enjoy tactual awareness of empty Euclidean space – since no effort is required to pass through Euclidean space, and there is no concomitant change in the shape of the body, we do not notice it. For Nerlich, recall, noticing is a condition on feeling. My claim, however, is not that there is no feeling, but that we do not notice the tactual awareness of empty space that we have. To this end, then, it is worth highlighting two other species of touch set out by Katz.

In comparing so-called ‘immersed’ and ‘volume’ touch, Katz tutors us:

“Direct a powerful stream of air against the hand, or move the hand with sufficient speed in liquids of various consistency – then one experiences a tactual phenomenon that has no definite shape or pattern. It has a certain thickness but cannot be regarded as spatial, because it lacks the rear boundary found in volume touch”. (ibid., pp. 50-51)

Here, the idiom of immersion should be taken literally. Immersed touch occurs when one (or part of one’s body) is immersed in, or surrounded by, the substance felt. Three points distinguish surface and immersed touch and bring the latter into focus.

First, immersed touch, or what Katz describes as “space-filling touch”, can only characterize a substance, not an object. This is because – and this is the second point – in surface touch, unlike immersed touch, the orientation and distance from the observer of the object, the tactile properties of which yield surface touch, are fixed. In immersed touch, however, the subject is *immersed* – she is surrounded entirely by the substance felt and so is not path-connected to it.

Third, and importantly, in immersed touch the sensation of resistance cannot be removed without removing the sensation. Take, for example, the experience of walking against a strong wind. One can struggle to move against it (head down, shoulders bent). But when the air is still, as it is after a storm, the resistance experienced is removed and *so is the sensation*. Unless it is warm or cold or moving, we don't usually feel the air that fills empty space.

Nerlich's supposition seems compatible with a treatment of the 'feel' of empty space on this model; in the Euclidean case, since resistance is removed so is the sensation. But I have made space for the possibility of tactual awareness *without* felt resistance; those cases where one feels the shape of the penny on one's palm, where one rests one's hand gently on someone's arm. Nonetheless, such experiences involve *contact* - they involve some happening or moment we can point to where contact, understood as an event, occurred. In our putative experience of empty space, however, there are no such analogous moments. To this extent, then, our intuition may remain steadfast: we cannot be said to enjoy tactual awareness of empty space.

In the next section, I dispute the claim that a sensation of contact is *essential* to tactual awareness.

5.

In claiming that empty space looks see-through, what is implied is that empty space has no visual *sensory* character; it is not coloured. As I have argued, however, this does not mean that it is not seen; empty space has visible properties that can be directly perceived so long as something is seen through the region thereby seen.

In the tactual case, it might be wondered whether a parallel can be forced such that empty space feels *felt-through*. As I explain below, this analogy is mistaken. There is, however, a commonality we *can* excavate.

Just as visual experience of empty space has no associated visual sensory character, so there is no tactual sensation, *understood on the model of experience of contact*, associated with our tactual awareness of empty space.

To bring out, firstly, the disanalogy with the visual case, consider Katz's notion of 'volume' touch.

In the discussion of immersion touch in the passage above, Katz insists that it has a kind of "thickness", but lacks the "rear boundary" found in volume touch. Here's an example of what he has in mind:

"Place a small object, such as a matchbox, on a solid support, and cover it with a thick layer of cotton wadding or cloths. If the object is then felt in order to recognise its form, we obtain a pretty good idea of what it is, and at the same time the filling material lying above it provides us with a space-like or volume touch". (ibid., p. 52)

Touch of this nature, says Katz, is also frequently deployed in medical practice:

"By palpation, the physician "touches" the internal organs through the skin and cushions of fat in order to detect pathological changes in them. The attention is directed at the organs themselves, and not at what lies between them and the feeling hand and is given as volume touch". (ibid., p.53)

This, then, is an example of touch-*transparency*. The volume touched-through – the intervening medium – becomes transparent. This is insofar as attention is directed at the "rear boundary", or that which is felt through the intervening medium. Water can obviously yield experience of volume touch; if you touch something through it. But it can also yield immersed touch – if you merely draw your hand through the water, as a child might when a passenger on a paddle boat.

Now, on the face of it, it might be thought that the notion of volume touch could happily apply to empty space. The 'feel' of empty space would then parallel the 'look'. What's more, this would explain the apparent transparency to *awareness* of empty space – our attention is directed to the objects felt-through, not the medium

through which they are felt. We do not notice it. But I think we should resist this parallel. Empty space can be felt independently of whether any object is met with through space - for example, we can enjoy tactual awareness of empty space when dancing. Even so, what the notion of feeling-through preserves is the intuition that the experience of contact, or of *meeting with an object*, is central to our understanding of the nature of touch. Below, I outline another way of accommodating this intuition - I explain why tactual experiences involving contact may require a *tactile ground* in order to 'stand out'. First, consider a case O'Shaughnessy (1989) details:

Say one's hand is numb. It is not the case, even though one experiences no sensation in the numb hand, that one cannot use it to discover some impediment by touch - for example, one can discover that one cannot push the hand through some obstacle, it cannot 'go any further'. But this suggests that just as there can be tactual awareness without experience of resistance, so there can be tactual awareness without the sensation of contact.

On the face of it, this suggests that a conceptual space is thereby made for forms of tactual awareness where there is neither felt resistance nor the sensation of contact, and we might think, as I do, that our tactual awareness of empty space can fill this lacuna. There is, however, a caveat we should note.

On the template model the distinction between 'within' and 'without' is grounded in bodily sensation - one experiences one's body as bodily when one is aware of a region extending beyond one's body that one is not aware of *in the same way* (viz. through felt sensation). Moreover, the qualitative aspect involved in bodily sensation, in being *bodily*, is not entirely subjective; it is at a felt location. But this in turn grounds bodily awareness - awareness of the approximate shape, configuration and current disposition of the body. Hence, although O'Shaughnessy's example reveals that one *can* perceive tactile properties without the *sensation* of contact, it should not be thought that a creature could lack all bodily sensation and still enjoy tactile experience. This is so on two counts:

First, without bodily sensation the subject would lack a sense of how her body is disposed at a time.

Second, nothing would ground the distinction between 'within' and 'without'.

This brings into view one final motivation for granting the claim that we 'touch' empty space, or whatever is 'outside' or 'without' the surfaces that we meet with in experience.

We can think of contact either as an event that occurs at a time, or as a relation between the perceiver and the thing felt. Naturally, the contact relation is established *when* the event of contact occurs, but the former can be sustained after the event, as when one runs one's hand across a piece of velvet, or simply holds the thing felt, a cup say. Critically too, just as there are events whereby the relation of contact is established – viz. where contact in the first sense occurs – there are events where what occurs is that the contact relation no longer holds; as when one lets go of the cup. This suggests the resources to translate Soteriou's argument, sketched in the last chapter, to the tactile case.

Having a tactile experience of oneself (parts of one's body) as coming into contact at a time with the surface of an object might be thought to require a concomitant awareness of whatever is tactually experienced at adjacent times, including times before the event, and hence prior to the contact relation holding. And one might think that having an experience of establishing contact with a surface also requires experience of whatever is outwith that surface at times prior to the contact relation holding, canonically empty space. Now, one way of accommodating such awareness might be to insist that when one is aware of the absence of tangible material outwith a surface, one is aware only *that* nothing is touched, inferring the present absence of anything tactile at a region from a failure to enjoy tactile experience. Arguably, however, such a conclusion fails to sort between an absence of tactile awareness at a time, such as when one is asleep and fails to feel the pillow underneath one's head,

and a tactual awareness of the absence of tangible material at a place, which, as I urge, is also felt.¹³¹

But if a condition on the experience of *contact* is tactual awareness of places at times before the contact event occurs (and the relation holds), then this just requires tactual awareness of regions at which the thing thereafter felt is not felt, typically empty regions. To this extent, such regions might be said to act as the *tactual ground* against which moments of experienced contact and the surfaces that ground them ‘stand out’. Katz introduces this notion by recalling Edgar Rubin’s work on visual figures:

“If we look at a piece of stiff linen, then we do not see nothing at the square openings, but rather empty space that is free of matter. Stiff linen provides an opportunity to study ambiguous figures in the sense of Rubin. One can either emphasize the square as figure, with the thread receding to ground, or, as is probably more natural, allow the space occupied by the thread to serve as the figure, with the openings then becoming the ground. Rubin certainly would not object if we were to apply his very stimulating reflections concerning visual figure-ground, *mutatis mutandis*, to three-dimensional tactual structures. If you move [your hand] over the bristles of a stiff brush... you will feel a discontinuous space filled with points, a tactual figure... *Between the points there is not “nothing” in a tactual sense, but rather empty tactual space that is not covered by matter.* The tactual space is covered discontinuously with the tactual matter of the brush points; the space between forms the tactual ground”. (my emphasis, 1989, p. 61)

Now, in elucidating the notion of a tactual ground, we do not have the metaphor of sketch to guide us. Still, there is a rough analogue we can tentatively appeal to - mime.

In watching mime, empty space is the visual ground against which the body and hence *what it is mimed as touching* (but which is not visually sensorily presented), stand out.

“The mime’s [the artist’s] body is an instrument; its bones, muscles, and joints, are the keys of that instrument; by playing articulately on

¹³¹ Note, where Soteriou’s treatment would, I presume, conclude that one must have conscious perceptual contact with regions where things could be felt but aren’t, I claim, in addition, that the regions at which no things are located are also experienced; although no thing is felt, it’s not the case that nothing is.

those keys, the mime tries “to make tactual space visible””. (Huston 1978, p. 65)

But although empty space is the visual ground for the body and what it is mimed as touching, it is also the visual ground for the body when what is mimed are episodes of experience where no thing is touched – say when the mime artist represents his protagonist walking through an empty region.¹³²

Now, in mime the medium of representation is bodily action. Hence, in watching mime, one observes actions. Yet just as there are characteristic ways the miming body *looks* when, through action, contact with material objects is represented, so there are characteristic ways the body looks when what is represented, through action, are episodes where nothing is touched; where the representing body represents movement through empty space.

From this suggestion we might extrapolate the following claim:

Just as there are characteristic ways the body looks when what is represented, through action, is movement through empty space, there are also characteristic ways the body *feels*, in a bodily sensation sense, to the mime, when such episodes are represented – there is a certain quality and ease of movement (which, granted, we might suppose is exaggerated in mime). But arguably, how the body feels when such episodes are represented is just how it feels in the non-representational case, since, unlike the pencil sketch, the medium of representation is action in three-dimensional space.

Still, we might wonder: How might we characterise how such actions feel and their associated qualities?

Here I suggest that we follow the strategy advocated elsewhere by Grice. We can indicate their feel and quality by demonstration. When you move your arm through empty space, this is the way that movement in empty space feels, “whatever that kind of way may be” (1961, p. 144). And when such movement is felt, so is empty space;

¹³² Naturally, in such instances the ground, in a literal sense, is touched, but I leave this qualification aside.

the movement is felt to be that way because one is moving through empty space which, if I am correct, one thereby perceives.

6.

I close by sketching some objections.

1. Objection from Particulars

It might be objected that when one touches things, one touches particulars, where particulars are distinguished by their place in space. In contrast, in putatively ‘touching’ empty space, nothing particular is touched – after all, one touches located things, *not the places at which they are located*.

Response: This worry is overcome once Absolutism is adopted. Moreover, once it is acknowledged that space is curved, and so disuniform, it becomes intelligible that particular regions can have particular properties (though, note, this flows from Absolutism and not specifically from the disuniform nature of curved space – viz. it is true also of absolute flat spaces). Besides, I have argued that the points of space have particularity without being particulars – they have their identity, just as days of the week do, in virtue of their particular position in manifold space, and this is so even while, like days of the week, one region may not be qualitatively distinct from another.

2. Objection from Path-Connection

Touch, it might be insisted, involves path-connection. Things that don’t touch have a path between them, whilst things that are touching are not separated by space.

Response: Leaving aside the question as to whether two *bona fide* bounded entities can ever be said to touch in this sense,¹³³ we have already a way of staving off this objection. We are happy to grant that immersed touch occurs. One can feel the water one is submerged in even though one is not path-connected to it.

¹³³ See Casati and Varzi (1999, pp. 74-75).

3. Objection from Fullness

It might be pointed out that *when* I am feeling empty space, empty space is not empty, since to feel empty space one must feel one's body extend to that region – this follows from the template model.

Response: To feel empty space one must move through it. But moving through empty space takes time. Hence, even while it may be true that when moving through a certain empty region one's body fills a sub-part of that region at a time, it is not true that at every moment within the interval of time that it takes to move through that region, one fills the entirety of that region (otherwise, one would not be moving through it).

4. Objection from Either/Or

I have argued that cases of tactual awareness without resistance and tactual awareness without contact make plausible a conceptual space that empty space can fill. It might be insisted, however, that either the sensation of contact *or* of felt resistance are necessary to tactual experience – one cannot have touch without one or the other.

Response: If either the sensation of contact or of felt resistance are necessary to tactual experience, then it must be maintained that where neither are experienced, nothing is felt. But this assimilates the absence of tactile experience – for example, such as there is when one is asleep – and the tactile experience of empty space in a tactual ground sense.

5. The Incompatibility of Awareness and the Failure to Notice

It might be wondered how it can be maintained that one can be tactually aware of something but, as I am urging, fail to notice one's tactual awareness of that thing. On such an understanding, awareness is a state that obtains in virtue of an experience. So, one cannot be in a state with the content (say) 'this region is empty' and fail to notice that one is in that state.

Response: There are different ways in which one can come to be aware of some fact or thing through experience.¹³⁴ One can come to be aware that the island is inhabited by seeing footprints in the sand, or, somewhat differently, one can be aware of objects in their entirety by seeing their facing parts. In such cases, the relevant awareness might be said to be indirect; to be mediated by, in the first case the perception of footprints (leading to the perceptual belief that the island is inhabited), and in the second the seeing of the facing surface of the object.

Now, I have argued, drawing on the template model, that one can enjoy tactual awareness of empty space *through* bodily awareness and sensation. It might be wondered what the import of ‘through’ is here.

Two possibilities seem open.

On the assumption that one is indirectly aware of empty space *in virtue of* one’s bodily awareness and sensation, then, the claim that one could enjoy such awareness without noticing it, would be difficult to sustain. For it would require that one is in an awareness state without noticing it. Consider a parallel. We rarely notice the feel of our clothes against our skin, but we can attend to how they feel if prompted. On the indirect model, the claim I am making in the case of empty space would thereby translate as follows: it would amount to a claim that we can be aware of the feel of clothes against our skin without noticing that we are aware of how they feel.

Fortunately, then, this is not the claim I am making, *pace* Nerlich, in the case of space. My claim is not that we can *come* to be tactually aware of the emptiness of a given region through bodily sensation and awareness, where ‘through’ is read in an indirect sense. But rather that *in* bodily sensation and awareness, we directly experience empty space; the experience and the awareness do not come apart.¹³⁵

¹³⁴ See Nudds (manuscript) for related discussion.

¹³⁵ See Richardson (2011) for a detailed defence of this claim.

6. *Objection from Semantics*

One might object finally that it just doesn't flow from what we *mean* by "touch" that we can touch empty space.

Response: Here we could once more appeal to the usual Gricean maxims - since every region in our vicinity is uniform, the fact that one has touched a particular region is irrelevant and uninformative. As such, though we typically have no cause to *say* that we touch empty space, this does not mean that it is not felt. It seems to me, however, that this response misses the insight at the heart of the objection. In fact, I think we should concede it.

We can, I think, allow that although we do not "touch" empty space (where this presumably captures the intuition that no experience of contact or resistance is undergone), there is nonetheless a sense in which we do 'touch' it; we enjoy tactual awareness of empty space. Besides, not everything we know about tactile perception is captured by the word "touch". Hence, even while it may be linguistically false that we "touch" empty space, it may yet be philosophically true.¹³⁶ It is this possibility that I have tried to make palpable here.

In the next chapter, I use this finding to generate a distinction between seeing and feeling empty space, and merely seeing see-through empty space.

in nuce:

In this chapter, I have argued that we have tactual awareness of Euclidean empty space, and I have defended this claim through an exposition of M. G. F. Martin's template model of touch.

¹³⁶ The contrast between linguistic and philosophical truth derives from R. A. Putnam (1969).

Specular Space

You can just see a little peep of the passage in Looking-Glass House,
if you leave the door of our drawing-room wide open

- Lewis Carroll, *Through the Looking-Glass*

In the last chapter, I argued that we can feel empty space. I use this conclusion here as a way of drawing a distinction between *seeing through* empty space and seeing *see-through* space.

When we see through empty space, we see regions that we could feel by moving through. But when we merely see see-through space, it does not follow that we are in a position to move through, and so feel, the empty region seen. For example, when I see Rue de Rivoli in Paris on a web-cam, though I can see see-through regions not yet occupied by bicycles or passers-by, I am not in a position to move through and so feel those empty regions (viewing them as I do in Glasgow).

I suggest we can use this distinction as a way of making sense of the perception of empty space ‘in’ specular objects – objects the surfaces of which reflect light. My strategy is to compare specular perception with the perception of empty space in perceptual objects, in particular figurative paintings.

The chapter unfolds as follows: In §1, I draw on Matthew Nudds’ strategy for sorting among the senses as a way of elucidating the distinction between seeing through empty regions, and merely seeing see-through regions. In §2, I explain how this distinction can be used to make sense of what is involved in learning to perceive with a mirror, and I sketch a puzzle that arises in the case of perceptual specular experience. Specular space is not seen through – by specular space I mean the space that is apparently looked through in looking at reflections of objects ‘in’ a mirror. Even so, it looks see-through. In §3, I offer an explanation as to why this is the case, before turning to the perception of empty space in figurative paintings (§4-5). I argue

that because reflections, like pictures, are superficial phenomena, seeing empty space in mirrors involves seeing-in, even while empty space in mirrors looks see-through (§6-7).¹³⁷

1.

Nudds (2004) argues that when we individuate the senses we distinguish ways of perceiving. For example, it makes sense to say that something, a vase say, is seen rather than touched, if seeing rather than touching has distinct consequences for judgments and actions that arise as result of the way the vase is perceived – this explains what Nudds describes as the *significance* of the distinction.

A way of perceiving something is significant, he says, if perceiving it in that particular way has consequences for what the subject does and thinks. We know that a way of perceiving is significant if, by learning that a subject had perceived something in that way, we learn more than if we had simply learned that the subject had perceived that thing:

“It is more informative to be told that Alice sees the vase, rather than to be told merely that she perceives it, since her seeing it makes it probable that she perceives that the vase in a certain way. That is, her seeing the vase makes it more probable that she perceives certain other properties of the vase, properties such as its shape, colour, and location, and so on” (2004, p. 44)

So, by seeing the vase rather than touching it, or by touching it rather than seeing it, the range of features that Alice perceives is distinct. For example, in touching it she may perceive its fragility, which in turn may have consequences, not only for how she touches it, but what she may do with it more generally (for example, she may keep it out of Kitty’s way). Equivalently, in seeing the vase, she perceives not just its shape, but also its colour, which in turn might lead her to evaluate it in a certain light.

¹³⁷ An abbreviated version of this chapter was presented at the Joint Sessions of the Aristotelian Society 2010, and will appear in the 2011 *Proceedings*, Part III. An earlier version was presented at the *Thumos* Perceiving and Feeling Workshop in Geneva, July 2010. I am also grateful to Tom Avery for detailed comments on an earlier version and to Akiko Frischhut.

Notably, this account is contrastive; it says that a vase is seen rather than touched, if seeing, rather than touching, has distinct consequences for judgement and action. But I think we can apply it conjunctively too. For example, while an antiques dealer may be able to identify a Ming vase by seeing it, she may only be able to determine its value if she can, in addition, feel it (the quality of the glaze for example). In this case, then, the consequences of seeing and feeling are distinct from those entailed by seeing or feeling alone. I suggest a similar distinction can be made between merely seeing empty space, and being in a position to see *and* feel a given empty region.

If one sees an object through a region, then one not only sees that region but, providing the curvature is relatively constant, is also in a position to feel it, i.e. *by moving through it*. But this being so, a subject that sees through a given region is in a position to perform actions that are closed to a subject that merely sees it. For example, a witness to a crime seen through a given empty region may be in a position to intervene. Not so the subject that only sees it on closed-circuit television. This suggests the distinction is ‘significant’ in Nudds’ sense.

As Nudds notes, some distinctions are not informative. Seeing something with the right rather than the left eye makes no real difference to what is perceived. Likewise, touching something with one’s hands rather than with one’s feet. But knowing that a subject both saw and touched something, rather than seeing or feeling it alone, is informative and, as I am urging, this is so even in the case of empty space. For example, the second witness, unlike the first, may be blameless in failing to intervene.¹³⁸

In the next section, I outline an intermediate case – specular, perceptual experience.

¹³⁸ Naturally, I don’t suppose it is informative to be explicitly told that a subject saw and felt a given region – this is a philosophical claim. It is, however, informative to know that a subject was at a given place at a given time. But if a subject was at a given place at a time then, *ceteris paribus*, the subject was in a position to feel the empty spaces in that region, namely by moving through them.

Suppose it looks to Grice as though there is a pillar in front of him, but what he in fact sees is a reflection of a pillar behind him. His coming to appreciate this much – namely that his perception of the pillar he sees is mediated by a mirror – involves an appreciation of the fact that, to touch the pillar he sees, he would have to turn away *from the mirror*. This suggests that the case of seeing space in mirrors is intermediate between seeing through empty space and merely seeing see-through regions.

When a subject sees an object ‘in’ a mirror, the subject is path-connected to that object (for otherwise the reflection of the object would not be seen ‘in’ the mirror). Nonetheless, the path the subject would have to move through so as to touch the object specularly displayed, and the path taken by light in visually presenting that object, come apart. In common with the non-mediated perceptual case, then, the subject *is* path-connected to the objects seen. The difference is, however, that it doesn’t see paths that it could move through *by seeing through them*. Rather, like other cases of mediated perception, see-through empty space is merely seen,¹³⁹ and this is so even though, because the subject is path-connected to the objects displayed, it is nevertheless in a position to feel the empty regions seen with concomitant consequences for action and judgment.

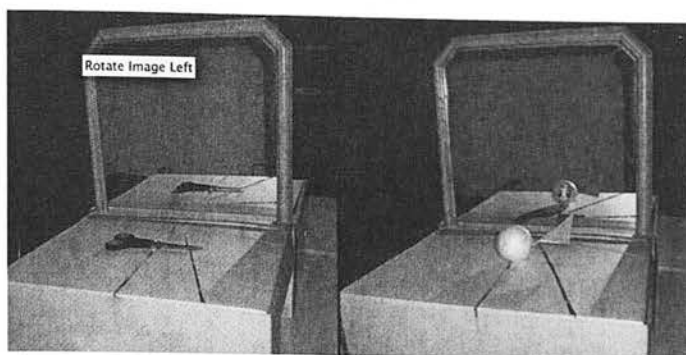
Notice that all of this assumes, however, that the subject is not, to borrow the idiom of Roberto Casati (forthcoming), *epistemically innocent* of the presence of a mirror.¹⁴⁰ That is, it assumes that the subject *knows* that it is perceiving with a mirror. But sometimes we are not so epistemically privileged; we can be ‘taken in’ by mirrors – we can mis-take specular space as space that can be moved through or into.

I clarify this thought.

Consider the image on the next page, borrowed from Savardi, Bianchi and Bertamini (2010).

¹³⁹ Except, of course, the region that *the mirror* is seen through.

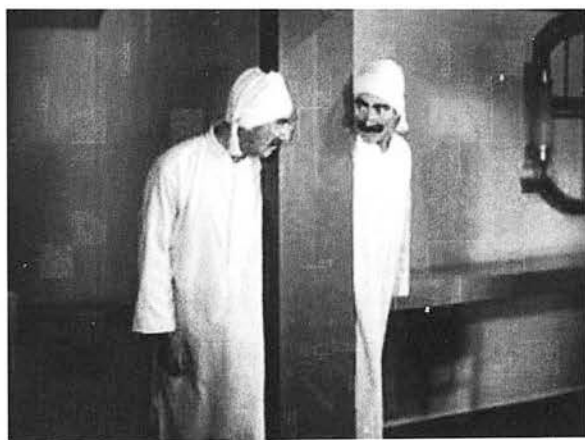
¹⁴⁰ I am grateful to Roberto Casati for access to his unpublished manuscript.



The experimental apparatus mimics the appearance of a mirror.
From Savardi, Bianchi and Bertamini (2010, p. 11).

Here, the experimental apparatus is set up to mimic the appearance of a mirror; two three-dimensional objects are arranged to look like a single entity and its reflection (something, of course, that the two-dimensional photo obscures). As such, the visual scene is supposed to be indiscriminable from the scene that would be presented were the frames to enclose instead a mirror.

The ‘mirror scene’ in the Marx Brother’s 1933 film *Duck Soup* deploys a similar strategy.



Duck Soup. 1933. Directed by Leo McCarey. Paramount Pictures.¹⁴¹

In this still shot, Harpo, on the right, is presented as being ‘in’ the mirror, while Groucho, on the left, is supposed to be the subject looking ‘in’. Harpo not being *Groucho* however, the space occupied by Harpo is not specular space, but three-

¹⁴¹ This still is available at www.howbase.com, <<http://www.howbase.com/soup/>>. Retrieved 12/09/11.

dimensional physical space, space through which, as later becomes obvious, the twins are path connected.¹⁴²

This helps makes sense of the idea of being ‘taken in’ by specular space.

Just as one can mis-take *three-dimensional* space for specular space, so, aptly, does the reverse hold: specular space can mistakenly be treated as three-dimensional. But, as such, it has a see-through look. I take this to be a puzzling fact about specular space.

If one can mistake specular space as space to move into, as one might in epistemically innocent cases, then the experience of seeing space in mirrors is phenomenally indistinguishable from the non-mediated perceptual case. But if there is no space *where the mirror is* and hence no space is seen through, how can ‘it’ - specular space - look so indiscriminable? How can ‘it’ look see-through? This is the question this chapter addresses. I take it to be puzzling since although, as Casati notes, perception mediated by the use of a mirror tends to leave a trace – namely on the objects reflected ‘in’ the mirror - empty space survives reflection unscathed. What’s more, since, as I argued in Chapter Four, empty space merely transmits biff, it is less apposite to say it is reflected, even though empty space is seen ‘in’ the mirror.

3.

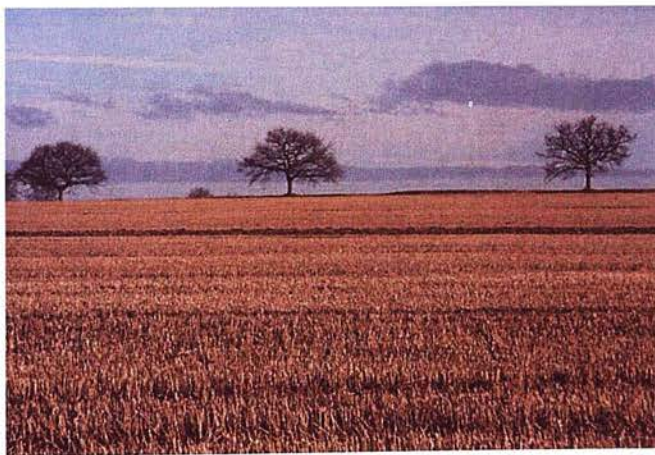
The claim that empty space seen ‘in’ mirrors looks see-through is motivated by the epistemically innocent case; if one can mis-take the specular case for the non-mediated perceptual case, as one does in cases of innocence, then how space looks ‘in’ mirrors is indistinguishable from how it looks in non-mediated perceptual experience. But since in non-mediated perceptual experience empty space looks see-through, or so I have argued, it must also look see-through in the specular case. The question is how. In what follows, I present a candidate explanation: I outline a view

¹⁴² The scene can be viewed on [www.youtube.com](http://www.youtube.com/watch?v=rdQ9jh5GvQ8&feature=related), <<http://www.youtube.com/watch?v=rdQ9jh5GvQ8&feature=related>>. Accessed 12/09/11. My thanks to Robert Leach for drawing my attention to this scene.

on which the space ‘in’ the mirror looks see-through because it looks to be continuous with the space *through which the mirror is seen*. Here’s a sketch of the idea I aim to explore:

When you look ‘in’ a mirror, the space *you are in* looks to be continuous with the space ‘in’ the mirror. For example, because your mirror reflection looks to be the same distance from the surface of the mirror as you, it looks to be twice the distance from you as the mirror is. But this being so, you seem to look through a path in specular space that is continuous with the path looked through in looking *to* the mirror. And in looking through, you thereby seem to see through and so to ‘see’ a specular space that is continuous with the space that you are in. The suggestion is that this appearance of continuity explains the see-through look of empty space seen ‘in’ mirrors. The empty space ‘in’ the mirror looks see-through because it looks to be continuous with the space *the mirror is seen through*. In what follows, I suggest that the same is true of empty regions that are *not* mediate perceived, but are nonetheless seen as continuous with empty regions that are seen through.¹⁴³ An example helps bring this latter claim into view.

Imagine looking at the scene captured in the photo below, from the place where it was taken (where this requires imagining looking at the *scene* itself, not the photo).



“Trees on the Horizon”. Photo: Bob Jones, wikimedia commons.¹⁴⁴

¹⁴³ In the next chapter I outline conditions on perceiving regions of space as continuous.

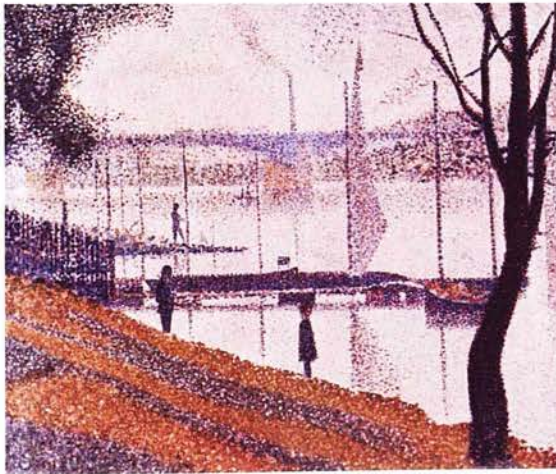
¹⁴⁴ This image is available at commons.wikimedia.org, <<http://commons.wikimedia.org/w/index.php?title=Special%3ASearch&search=bob+jones+trees+horizon>>. Retrieved 12/09/11.

In seeing the trees, it might be said that you also see the empty spaces between them, as well as the empty regions that separate their branches. Since, however, you see these empty regions – the empty spaces between the branches say - *through other regions of empty space* – viz. the space you see the *trees* through – you don't see the empty spaces between the branches *by seeing through them*. Still, if my phenomenology is acute, they have a see-through look. I suggest that they look see-through because they look to be continuous with regions that *are* seen through – the empty regions one sees the trees through.

In the next section, I consider the perception of empty space in figurative paintings as a way of clarifying this thought.

4.

Pictures are, we might say, *phenomenally expansive*, even while they represent empty space. This is most obvious in pointillism. In the painting below by Georges Seurat no 'point' is uncoloured – there are no gaps or lacunae. Still, empty space is 'seen'; the observer on the bank is seen as at a spatial distance from the boat in the background, and no opaque objects are depicted as interposed in the space that separates them.



GEORGES SEURAT, *Le Pont de Courbevoie*.1886-87. Oil.
Courtauld Institute, London, [wikimedia commons](https://commons.wikimedia.org/wiki/File:Le_Pont_de_Courbevoie_-_Georges_Seurat.jpg).¹⁴⁵

¹⁴⁵ See commons.wikimedia.org,
<<http://commons.wikimedia.org/w/index.php?title=Special%3ASearch&redirs=1&search=Georges+Seurat&fulltext=Search&ns0=1&ns6=1&ns12=1&ns14=1&ns100=1&ns106=1&uselang=en>>. Retrieved 12/09/11.

Rudolf Arnheim makes a similar point, here drawing a distinction with sculpture:

“Within the frame of a painting every spot is positively present, first as a material part of the paint-covered canvas and secondly as a substantial element of the pictorial construction. In a completed painting, the units of the composition vary as to their apparent density and also as to their spatial position within the figure-ground hierarchy, but none of them may give us the impression of an empty gap, a hole torn in the pictorial tissue. This is different in sculpture, where we are used to find all spatial relationships limited to the figure itself. These relations often reach across a void – and the length of the leap counts compositionally – but they generally do not include these intervals the way they would in a painting”. (1948, p. 33)

Arnheim’s observation is that in pictorial compositions, although figures are represented in relation to a ground, there are no empty spaces or gaps in the “pictorial tissue” - in the idiom above, the painting is phenomenally expansive even though empty space is depicted. This, however, is distinct from sculpture.

In painting, the spatial relations between represented entities are also represented; they are represented *by* the ground. But in sculpture, at least “generally”, all spatial relations are relations that obtain between parts of the *figure*; the ground is not part of the composition. To this extent, however, Arnheim suggests that the sculpture of Henry Moore is distinct, though not without historical precedent (he mentions Bernini’s horsebackriding Louis XIV, “the sweeping locks and folds collect the air in hollow pockets” (ibid., p. 35)). He argues that Moore’s figures “capture” portions of space, mostly through the use of concave forms, thereby making those regions part of the composition.

This idea is best understood by example.



HENRY MOORE, *Reclining Figure*. 1951. Bronze.
Scottish National Gallery of Modern Art, Edinburgh, wikimedia commons.¹⁴⁶

Here the cavity in the figure's abdomen is part of the composition – as Arnheim puts it, three-dimensional space is an “active partner” in the composition (I pick up a related thought in the next chapter; I argue that objects and empty space are *co-seen*). But in classical sculpture, in contrast, “the discipline of the style is all internal”; that is to say, it pertains only to the *figure*; “there is little capacity or desire to expand beyond the basic block. The function of the surrounding space is almost exclusively negative” (ibid.). Consider the familiar image of the *Venus de Milo* in light of this observation.

¹⁴⁶ See commons.wikimedia.org,
<<http://commons.wikimedia.org/w/index.php?title=Special%3ASearch&search=henry+moore+scottish+national+gallery>>. Retrieved 12/09/11.



Venus de Milo. 130-110 BCE.
Louvre Museum, Paris, [wikimedia commons](https://commons.wikimedia.org/wiki/File:Venus_de_Milo.jpg).¹⁴⁷

Here, the empty space that surrounds the statue is not part of the composition, something that is most obvious where parts of the ‘tissue’ of the sculpture are missing; in observing that the arms are missing, one does not thereby include, *as part of the composition*, the regions at which the arms are absent. Recalling a distinction made in Chapter Three, the statue is *in space* but empty space is not *in the statue*.

This helps make sense of the contrast Arnheim details so as to bring *Moore’s* innovation into view:

In painting, the ground *is* part of the composition, though what is included is not empty space. Moore’s work also makes the ground part of the composition, but in including the ground, *empty space* becomes part of the tissue of the sculpture. This, then, is unlike the *Venus de Milo*. The empty space that surrounds the statue is not part of the composition. Still, if what I argued in the last chapter is correct, an apprehension of an absence of the sculptural tissue at certain locations is grounded in the non-epistemic perception of empty space. As such, this *intensional* apprehension is quite unlike the *extensional* perception of absence that is involved in perceiving the

¹⁴⁷ See commons.wikimedia.org,
< <http://commons.wikimedia.org/w/index.php?title=Special%3ASearch&search=venus+de+melo>>.
Retrieved 12/09/11.

cavities that, if Arnheim's analysis is apposite, are part of the fabric of Moore's sculpture. For it does not seem that, in perceiving those regions, one sees them *as* regions where objects would be seen were they to take up those spaces (although it is true that objects would be seen were they so located). In the pictorial case, however, even the possibility of such intensional apprehension seems foreclosed. When empty space is pictorially represented, one does not perceive the region depicted as a region where something could be seen but isn't. For empty space is *materially* depicted. But this being so we might ask:

Given that the ground *is* part of the pictorial composition, but that empty space is not – there are no gaps in the pictorial tissue – how does immaterial empty space 'get into' the material phenomenal expanse? I take up this question in the next section.

5.

Discussing Raphael's *The Expulsion of Heliodorus in Art and its Objects*, Richard Wollheim outlines a possible 'get-in' strategy. He writes:

"It is hard to see, for instance, how a man could 'read' the void in the middle of Raphael's fresco if he was not at the same time able to make out the spatial relations that hold between Heliodorus and the youths who advance to scourge him, or between the Pope and the scene that he surveys in calm detachment". (1980, p. 14)



RAPHAEL, *The Expulsion of Heliodorus from the Temple*. 1511-1512.
Apostolic Palace, Vatican City, [wikimedia.commons](https://commons.wikimedia.org/wiki/File:Raphael_-_The_Expulsion_of_Heliodorus_-_Vatican_Museums.jpg).¹⁴⁸

Here Wollheim's proposal is that one could not 'read' empty space into the phenomenal expanse – that is, one could not see *that* there is empty space 'in' the middle of the fresco – unless one could already “make out” the spatial relations that hold between the figures depicted. As such, he supposes that there is a kind of perceptual appreciation of spatial relations that precedes seeing that certain relata are separated. His proposal is that we *see-in* such spatial relations.

For Wollheim, *seeing-in* denotes a very specific sui generis type of visual experience, one that is perceptual rather than cognitive, and which is nonetheless distinct from face-to-face perceiving and visualisation. He summarises his thesis as follows:

“When a picture represents, say, a horse, the appropriate experience to be had in front of it is to see a horse in its painted surface, and what is most distinctive of the phenomenology of such an experience is what I call twofoldness, or that, within a single experience, but as separate aspects of it, I am aware of the surface and of a horse”.
(2003, p. 133)

Here, a visual experience of a representational painting is “appropriate” if it is the kind of visual experience in virtue of which the representational properties of the painting can be explained (ibid., p. 131). Such an “appropriate” experience is one that

¹⁴⁸ See [wikimedia.commons.org](https://commons.wikimedia.org/wiki/File:Raphael_-_The_Expulsion_of_Heliodorus_-_Vatican_Museums.jpg),
<<http://commons.wikimedia.org/w/index.php?title=Special%3ASearch&redirs=1&search=fresco+raphael+expulsion+of+heliiodorus&fulltext=Search&ns0=1&ns6=1&ns12=1&ns14=1&ns100=1&ns106=1&uselang=en>>. Retrieved 12/09/11.

involves twofoldness. That is to say, it involves seeing *both* the surface of the painting and what is represented simultaneously.¹⁴⁹

In the case of empty space, then, we might suppose the following: when a picture represents empty space, the “appropriate” experience “to be had in front of it” is to see immaterial empty space ‘in’ the painted material surface *and* to be simultaneously aware of the surface of the painting, *and* hence, if what I have argued so far is correct, the empty space ‘outside’ the surface that is *not* part of the composition.

I return to this notion of appropriateness below. First, I clarify an idea sketched at the close of the last section.

Above I noted that sometimes distant empty regions can be seen through *other* empty regions; the example I offered was the experience of seeing trees on the horizon. In seeing the trees, I suggested, you also see the see-through space that is between them and that separates their branches. Since, however, you see those empty regions – for example, the empty spaces between the branches - *through other regions of empty space* – you don’t see the empty spaces between the branches *by seeing through them*. I suggest that we can harness the notion of phenomenal expansiveness to reify this phenomenology.

Consider how distant regions seen through (other) empty spaces appear. It seems they are also presented phenomenally expansively, something that René Magritte’s *La Condition Humaine* (below) illustrates.

¹⁴⁹ Hence, one does not see one and then the other – something Ernst Gombrich maintained. See Maynard 1994.



RENÉ MAGRITTE, *La Condition Humaine*. 1933. Oil.
The National Gallery of Art, Washington.¹⁵⁰

Here the parody is that, save for a tiny glimpse of the side of the stretched canvas, the view seen through the window and that seen-in the painting are indistinguishable – they both appear to be phenomenally expansive. Still, there is a difference.

Though distant empty regions may not be seen through, they are continuous with regions that *are* seen through, *and through which we see those distant regions*. Hence, insofar as they are continuous with space that *is* seen through, they can be attributed a see-through look. My thought is that the same is true of the phenomenal character of specular space. Specular space looks see-through since it looks to be continuous with the space which one sees *the mirror through*, space which, as I argued in Chapter Three, has a see-through look. But this in turn explains why one can occasionally mis-take oneself, when epistemically innocent of the presence of a mirror, to be path-connected, *through* specular space, to the objects specularly displayed.

¹⁵⁰ Image is available at www.nga.gov,
<http://www.nga.gov/cgi-bin/tinfo_f?object=68966.0&detail=none>. Retrieved 12/09/11.

In the epistemically innocent case, the space 'in' the mirror and the space 'outside' the surface of the mirror are perceived to be *distinct* sub-regions of *the same space*. Hence, one does not see the space 'outside' the surface of the mirror as a sub-region of the space *in which the mirror is*. This, then, is *unlike* the *Venus de Milo*; as I noted, one sees the empty space 'outside' the statue as the space in which the statue is. Still, nor is an analogy with the work of Henry Moore acute – viz. where empty spaces are *included* as part of composition. I spell out this thought by returning to the non-specular world.

On the assumption that empty space must be seen-in a pictorial phenomenal expanse, it might be wondered whether distant regions that, as I have explained, also appear phenomenally expansively and which are non-mediate perceived, must likewise be seen-in. I suggest one reason to resist this thought:

Unlike a painting, which is a perceptual object, when one sees distant regions one perceives a sub-region of the larger space in which one is. But this being so, one does not see the empty space *one sees those regions through* as a sub-region of a space that is *distinct* from the space in which those distant objects are located. Rather one sees distinct sub-regions of the *same* space.

To clarify this thought, recall what is involved in seeing empty space 'in' pictorial perceptual objects. It involves seeing the empty space 'in' the material phenomenal expanse and the empty space 'outside' the surface of that expanse and through which that surface is seen. What's more, it involves an appreciation that the space 'in' the phenomenal expanse is part of the composition, while the empty space 'outside' the surface of the painting is not. But in contrast, and disanalogously, when one perceives distant regions, including empty spaces, one perceives such empty regions as *continuous* with the empty space one sees them through – both regions are perceived to be sub-regions of the same larger space. But to this extent they are rather like the empty spaces that are part of *Moore's* composition. The empty spaces that Moore's work "captures" are continuous with the empty regions *through which the work is seen*.

So how far we have come?

I have argued that empty regions that are seen through *other* empty regions, although they are presented as part of a phenomenal expanse, can nonetheless be attributed a see-through look. This is because they appear continuous with the spaces through which they are seen. I have suggested that empty space, when seen in a mirror, also looks see-through because it looks to be continuous with the space *the mirror is seen through*. Critically, however, this is so even in the epistemically un-innocent case – that is, when one’s actions and judgements are counterfactually sensitive to the presence *of a mirror*.

But this suggests a further question: Why does specular look see-through even in cases of uninnocence – that is, even when one knows that the space in the mirror is the space *in which the mirror is*?¹⁵¹

Below I argue that because the space ‘in’ the mirror is the space *in which the mirror is*, one’s visual experience displays ‘elasticity’ - patterns of ‘expansion’ and ‘contraction’ that cue awareness of the presence of objects and that are typically characteristic of *non-mediated* perceptual experience.¹⁵² I suggest that this explains the appearance of continuity in virtue of which specular space looks see-through.

¹⁵¹ The term ‘uninnocent’ is Casati’s and I use it throughout.

¹⁵² Elasticity is supposed to capture a phenomenological notion. Nonetheless, it may be partly spelt out by appeal to motion parallax and motion perspective, psychological notions. Motion parallax refers to the movement of the “projections” of several stationary objects caused by the movement of the observer (see Cutting 1995, p. 89), while motion perspective refers to “the field of relative motions of objects rigidly attached to a ground plane around a moving observer....it specifically does not refer to object motion” (Cutting 1997, p. 31). Notably, so called ‘flow rates’ can vary as a function of distance. As Helmholtz noted: “In walking along, the objects that are rest by the wayside stay behind us; that is, they appear to glide past us in our field of view in the opposite direction to that in which we are advancing. More distant objects do the same only more slowly, while very remote bodies like the stars maintain their permanent positions in the field of view” (Helmholtz 1876/1925, p.295, quoted in Cutting 1995, p. 89).

In outlining his account, Casati details a thoughtful parallel. Mirrors, he says, act like windows rather than images. If you retreat from a full-length mirror, the space ‘reflected’ will enlarge as more of the room comes into view. Likewise, what is seen through a window changes with the movement of the observer. But pictorial empty spaces are *inelastic* in this sense – they are not responsive to movement.

A way of understanding why pictorial spaces are inelastic is to recognize that figurative pictures inscribe what Wollheim (1998) describes as ‘a spectator in the picture’ – in addition to *what* they depict, they also depict *a point of view*. What they depict is depicted from somewhere. In contrast, while specular spaces are presented perspectivally, they do not inscribe a spectator. Still, there remains a sense in which looking at a picture and looking at a mirror image are somewhat similar. One can adopt ‘a spectatorial attitude’ or ‘pictorial stance’ when *viewing a mirror*. Walton’s (2002) imaginative account of pictorial experience (which I implicitly called upon above) helps illustrate this thought.

For Walton, when viewing a picture one *imagines* one’s perceptual experience (the seeing of the painting) to be *another* perceptual experience (the seeing of what the painting depicts). Although the perspective one has *on* the painting is distinct from the perspective depicted *by* the painting, one imagines one’s current perceptual experience of the picture, with its current elastic perspectival properties, to be an experience of perceiving, *from the depicted point of view*, what is depicted.

He characterises the experience of viewing Nicolas Poussin’s *Rinaldo and Armida* as follows:



NICOLAS POUSSIN, *Rinaldo and Armida*. 1629. Oil. Dulwich Picture Gallery, London, [wikimedia.commons](https://commons.wikimedia.org/wiki/File:Nicolas_Poussin_-_Rinaldo_and_Armida_-_WGA01299.jpg).¹⁵³

“The viewer of *Rinaldo and Armida* is actually at a certain place relative to the picture – seven feet from it and slightly to the left of center, for instance. It is from this position that one sees Rinaldo in the picture surface. But this location in space does not correlate with one’s perspective on Rinaldo in the sense in which “his face is turned toward us”, the sense in which it is the perspective from which he is depicted. To change one’s position relative to the canvas, to move closer to it, for instance, or further left, does not affect one’s point of view in the latter sense. (This is why we can say that the picture depicts Rinaldo from a certain point of view; we cannot normally say this about freestanding sculpture)”. (2002, p. 29)

I suggest that this helps explain how one can adopt a pictorial attitude when viewing a reflection in a mirror:

The perspective one has *on the mirror* (and hence on what it displays) is imagined to be a *depicted perspective* (or, in cases where a mirror is used as an aid to depiction, the perspective that is to be depicted). Still, unlike pictorial space, specular space remains elastic, and it is elastic because the subject is path-connected *both* to the objects displayed *and to the mirror*. But this, in turn, explains the appearance of continuity in virtue of which specular space can be attributed a see-through look.

¹⁵³ Available at [wikimedia.commons.org](https://commons.wikimedia.org/wiki/File:Nicolas_Poussin_-_Rinaldo_and_Armida_-_WGA01299.jpg),
<<http://commons.wikimedia.org/w/index.php?title=Special%3ASearch&search=rinaldo+and+armida>>.
Retrieved 12/09/11.

When a subject is path-connected to the objects his experience phenomenally presents, his experience displays characteristic patterns of ‘expansion’ and ‘contraction’ that cue awareness of the presence of objects and, as I will argue in the next chapter, the empty space that is their ‘outside’. But, critically, one’s experience can only display such elasticity when one shares the same space as the objects and regions that one sees – that is, when the empty regions one sees are part of the space *in which one is*.

But this also accounts for the elasticity of specular experience. Because the subject is path-connected *to the mirror*, when the subject moves, the changes in the visual angle which *the reflection* subtends mimic the changes in the visual angle that objects would sub-tend were the subject to approach or retreat from those objects in the non-mediated perceptual case. This, then, makes sense of the appearance of continuity in virtue of which a see-through look can be attributed to specular space.¹⁵⁴

Because specular experience is elastic, the space ‘in’ the mirror looks to be continuous with the space through which the mirror is seen and, as I have argued, because it looks continuous it can be attributed a see-through look. But critically, this is so even in the epistemically uninnocent case – where one *knows* that the space in the mirror is the space in which one is. As such, this leaves one final question: In looking see-through, is empty specular space not, then, seen-in?

7.

Recall, seeing-in involves twofoldness. That is to say, it involves seeing both the surface of the painting and what is represented simultaneously. Wollheim glosses twofoldness as follows:

¹⁵⁴ It ought to be noted that treating such ‘elasticity’ as visual evidence for the continuity of space requires representing the continuity of space independently of one’s movement through it – I consider this additional requirement in the next chapter.

“Looking at a suitably marked surface, we are visually aware at once of the marked surface and of something in front of or behind something else”. (1998, p. 221)

The question is whether specular experience is also twofold. I propose that the answer we give will vary as a function of innocence.

In epistemically uninnocent cases, and where one's judgements and actions are “appropriate” to the seeing of a mirror, it seems apposite to say that we *are* aware of “something in front of or behind something else”. After all, the specular image appears *behind* the surface of the mirror. To this extent, then, the experience might be said to involve seeing-in, though, critically, with a distinction. The *space in which the mirror is* is the space one sees. But, as such, one is aware that the space ‘outside’ the surface of the mirror is distinct in from the space ‘in’ the mirror only insofar as they are *not* perceived to be distinct sub-regions of, by analogy with non-mediated perceptual experience, the same space, or, by analogy with pictorial experiences, distinct sub-regions of distinct spaces – rather one perceives that they are the *same* sub-region.

What, though, of cases of innocence?

It might be objected that in epistemically innocent cases, and specifically where the mirror is clean and planar, there *can* be no two-fold seeing, since in such instances one doesn't see the surface of the mirror. But this, it seems to me, is not quite right. Though it may be true that in epistemically innocent cases one doesn't intensionally represent the surface *of a mirror*, and hence that one has no phenomenologically salient experience of twofoldness, it is not true that one doesn't see the surface and the reflection *at the same time*.

Consider a parallel case: the non-mediated perception of colour. To see the colour of an object, one must see its surface. But a reflection is like a colour in this sense: to see a reflection *one must see a reflecting surface*.

To this extent, however, even in the innocent specular case, there *is* a kind of two-fold seeing. Specular experience is a superficial phenomenon, which explains why the region *the mirror occupies* is not seen through – there are no gaps in the specular tissue, no holes in the mirror. The difference is, however, that in “appropriate” specular experience there is perceptual *success* – there is a *seeing* of the space in which the mirror is, albeit a seeing that is also mediated by the perception of a mirror. But in the second, innocent case the experience is illusory – there is no space where one perceives space to be. Put somewhat differently, one takes the tissue of perceptual experience to include empty regions which it does not include. I spell this final thought out.

One does not see through regions where opaque objects are located – recall, it is as though they offer resistance to the eye, “a barrier beyond which the eye cannot pass” (Katz 1935, p. 8). But the same is true of regions where reflecting surfaces are found.

One does not see through reflecting surfaces, or at least so long as they are not, like windows, transparent. Yet for this reason, and despite its elasticity, where specular space is not seen-in, *there is no seeing*. For the space one appears to see is no where. There is no such space.

This completes my speculative account.

in nuce:

I have distinguished between seeing through empty space and seeing see-through space, and I have argued that specular experience is an intermediate case. While the subject *can* see and feel regions specularly displayed, namely because he or she is path-connected to the objects visually presented, it remains the case that the subject does not thereby see regions to move through *by seeing through them*. I have explained why specular space looks see-through – namely because it looks to be continuous with the region the mirror is seen through. And why, because reflections are superficial phenomena, specular space must be seen-in, despite looking see-through.

In the final chapter, I spell out conditions on perceiving space as continuous, and in particular I try to elucidate the complicity between perceiving objects and perceiving empty space, a complicity gestured at in Arnheim's notion of space as an 'active partner' (*espace-partner*). As I explain, objects and empty space are *co-seen*.

Taking Up Space

Together as carpenters with hammers
we have taught the distance
how to build a roof
from the trees
we run between

- John Berger, *and our faces, my heart, brief as photos*

In this closing chapter, I try to make sense of the contribution of objects to the perception of empty space, and to weave together some of the lines of thought that have run through this thesis. I iterate those that are relevant for the argument that follows.

In Chapter One, I motivated metaphysical absolutism as an assumption, but I also indicated that our naïve category ‘space’ is absolute; we think of things as moving in space, but we don’t think that space can move. Likewise, we experience the region of space of which we have experience as a sub-volume of a larger space.

In Chapter Five, I detailed how, on the Structural View, an awareness of the space of which one has experience as a subvolume is attendant with a grasp of one’s sensory limitations. I outlined in what sense perceiving empty space in a ground sense is thereby dependent on an implicit conception of space as absolute – the requirement that one experience one’s visual field as bounded requires that one implicitly conceive of space as absolute.

In Chapters Three and Six I argued, in line with the metaphysical assumption adopted in Chapter One, in favour of a content view of seeing and feeling empty space – one that appeals to the *matter* of experience. I explained why we need not think of perceiving empty space as a species of absence perception.

And in Chapter Seven, I noted that when one is path-connected to objects seen through a given region, one's visual experience is apt to display 'elasticity', characteristic patterns of 'expansion' and 'contraction' on movement. I argued that specular space is elastic.

In what follows, I tie together some of these thoughts.

Drawing on a notion introduced in Husserl's 1907 *Thing and Space* lectures, I argue that objects and empty space are *co-seen*; this follows Husserl's emphasis, declared at the outset, on "not the mere isolated thing but the thing together with its thingly environment" (1997, p. 7, lines 18-19).¹⁵⁵ I argue, however, that this is so in *two* distinct respects:

To see objects as taking up space or, as Strawson (1961, p. 54) puts it, as space-takers, one has to represent empty space as something that objects can take up. But such co-seeing is not yet phenomenally foundational, in a sense to be made clear, since there could well be creatures which, although they co-see objects and empty space, do not see empty space as space that could be filled.

Here my argumentative strategy is as follows:

When Husserl affirms his commitment, not to "the mere isolated thing" but to "the thing together with its thingly environment", he naturally takes the *perceiver* to be part of that thingly environment. But this in turn yields the datum that he takes as his starting point: two non-identical perceptions can present the same object.

"Take a house as seen now from the front, and now from the back, or as seen from the inside and then from the outside. If we consider these perceptions within the the phenomenological reduction... then each one appears differently... Nevertheless, we say, and with certain evidence, that they present the same house". (1997, pp. 22-23, lines 32-35)

¹⁵⁵ I am grateful to Olivier Massin for bringing the notion of co-perception to my attention. See Massin (2010, §12.3, p. 432).

For Husserl this is a datum and ‘harbours no mystery’. But for some philosophers, the fact that perception is from a “standpoint” (ibid., p. 9, line 3) is apt to provoke a puzzle – one that requires a philosophical resolution. For example, consider this description of the phenomenology of seeing a tomato given by Alva Noë in *Action in Perception*:

“Suppose, for example, that there is a tomato on the table in front of you. The facing side (facet) of the tomato is interposed between you and the far side and underneath (as well as the insides) of the tomato. You can only see part of the tomato’s surface”. (Noë 2004, p. 76)

With this description, Noë aims to diagnose a feature of perceptual experience that he supposes requires philosophical treatment. The ‘problematic’ feature of experience that he discovers in this phenomenology is as follows:

Though we only see a part of the surface of the tomato, we experience it as voluminous - as three-dimensional. But, says Noë, “experiencing a bit of a surface isn’t like experiencing a solid thing” (ibid., p. 76). So the question is how we can come to perceive the tomato as three-dimensional given that we “can only see part of the tomato’s surface”. On this understanding, seeing the facing surfaces of objects isn’t sufficient for seeing them as space-takers.

It should be noted that this experience has been found problematic in another sense, one that is perhaps more familiar. Even though we perceive the object in its entirety, we can remove bits of the object we see - by hollowing out a half-sphere for example - without changing the way the object looks.¹⁵⁶ This is not the difficulty that Noë means to address. On this more familiar construal of the ‘problem’, it can be acknowledged that the hollowed-out half-sphere *is* seen as voluminous. In contrast, Noë’s problem is to explain precisely how we can experience an object as three-dimensionally extended given that we only see part of its surface. Importantly, on Noë’s understanding, surfaces aren’t experienced in the same way as solid things are (“experiencing a bit of a surface isn’t like experiencing a solid thing”). This, then, is why a problem arises: “Despite the fact that you can only see part of the object’s

¹⁵⁶Thank you to Matt Nudds for emphasising this point.

surface [which, critically, isn't like experiencing a solid thing], in looking at it we enjoy experience as of a voluminous solid" (ibid.).

My goal in this chapter is to try to show that, on an adequate characterisation of the phenomenology, there is, after all, no 'problem' to begin with. This is so for two reasons. First, when we see the surfaces of objects, this is not *all* we see; we also see the empty space 'outside' those objects. Second, as I will explain, we see this empty space as continuous and as having dimensionality. But since we see it as continuous *with the space that the object occupies*, we thereby see the *object* as three-dimensionally extended. As such, I treat Noë's 'puzzle' as a ruse. I consider it only as a way of trying to elucidate the distinct species of co-seeing it is the task of this chapter to set out.

1.

In Chapter Three, I noted Bermudez's distinction between immediate and direct perception, and I explained how this refinement allows him to argue that, although the immediate objects of perception are the surfaces of objects, a perceiver can nonetheless make true demonstrative reference to objects by perceiving those parts. Hence, while three-dimensional material objects are never the immediate objects of perception, they can be directly perceived.

This distinction provides an answer to the question as to what the immediate objects of perception are. The 'problem' Noë gestures at, however, asks a different question. It asks not what the immediate objects of perception are, but how objects can be perceived as three-dimensional given the fact that we only see their facing surfaces. As such, it spins on the apparent incompatibility of two plausible claims: (i) we *perceive* objects as three-dimensional and (ii) the only part of the object we *see* is the part that faces us.

Now, so cast, it might be supposed that the problem arises only on a covert equivocation on the words "see" and "perceive" – you *strictly speaking* see less than

you perceive. On such an understanding, the challenge in defusing the puzzle then is to explain how we can ‘get from’ seeing, strictly understood, to perceiving. This is explanatory strategy I take Noë to pursue.¹⁵⁷ He argues that our tacit grasp of how the shape of a perspectively presented object varies with movement, augments or enhances visual experience in such a way that makes those parts of the object that we don’t (strictly speaking) see perceptually present.¹⁵⁸ My aim is not to challenge this solution, but only to explore how the datum that gives rise to Noë’s puzzle is described.

Take Noë’s assertion above that “you can only see part of the tomato’s surface”. There are two natural ways of reading this assertion. First, as a claim that seeing is exhausted by the seeing of the facing part of the object. And second, as a claim that the only part of the object that you see is the facing surface. The latter claim seems straightforwardly true, and the former, if what I have argued in this thesis is correct, false.

As I argued in Chapters Three, Five and Seven, when you see the surface of the object (and perceptual objects like paintings), you also see the empty space ‘outside’ those objects. But, as such, there is a distinction in what the ‘only’ above qualifies. It may qualify the experience or it may qualify the object seen. Read one way it says that *all* you can see is the facing surface of the tomato *and nothing else*. Read the other, it says that all you can see *of the tomato* is the facing surface and no other part of it. But read this way, the claim that ‘you can only see part of the tomato’s surface’ doesn’t exclude the claim that you also see the empty space outside it, a reading that ‘harbours no mystery’ at all. For though you only see the facing surface *of the tomato*, this is not *all* you see; you also see the empty space ‘outside’ it. Even so, this is not yet an adequate description of what we see.

Although you see the surface of the tomato and the empty space ‘outside’ it (the space you see it through and the see-through space that articulates its boundaries), you also

¹⁵⁷ See Kalderon, forthcoming.

¹⁵⁸ Another strategy is to preserve instead a modest identity between seeing and visually perceiving but to augment instead the kinds of content that can penetrate experience. For example, it might be urged that the imagination is involved in ‘filling out’ the dimensionality of objects when only surfaces are perceptually given (for example, Nanay 2010).

see these regions as continuous with the region that the tomato occupies. Moreover, since you see these empty regions as having dimensionality, this explains why you perceive, indeed see, the voluminosity of the object. Since you see the empty space outside the tomato as continuous and as having dimensionality, and since you see the space the tomato occupies as continuous with these regions, you see the tomato as a space-taker.

The rest of the chapter takes the following shape: In §2, I set out the theoretical notion of co-perception in more detail. In §3-4, I defend the claim that when one sees empty space as space that objects could take up, one co-sees objects as space-takers. I argue that seeing empty space as space that objects could take up involves seeing it as continuous and as having dimensionality, and I explain that one can only represent space as continuous and as having dimensionality if one can represent objects as space-takers. As such, empty space as space that objects could take up and objects, *qua* space-takers, are co-seen. Call this a ‘no-priority’ view. I close, in §5, by outlining two *priority* views – views on which either a representation of space, or of objects, is prior to the representation of, in the first case, objects and, in the second case, space. I raise challenges for both species of priority theorist.

2.

When you see the tomato, you also see its thingly environment – the window sill it is ripening on, the garden beyond the window pane. More than this though, if what I have argued in this thesis is correct, you see the empty space that you see the tomato through, and you see, at its boundaries, the see-through space in terms of which those boundaries are articulated. What’s more, you see these spaces as continuous with the space *that the tomato itself occupies*.

As I have noted, the idea that objects and empty space are co-seen can be traced to *Ding und Raum*, the title ‘Thing and Space’ signalling how the seeing of one is interwoven with the seeing of the other. For the most part, though, Husserl talks only

about space; empty space – that is, empty space in a ground sense – is hardly mentioned. We can, however, reconstruct the thought he appears to have in mind.¹⁵⁹

A thing is such that the way it looks to a subject can vary with movement.¹⁶⁰ For example, when you approach a body, since the visual angle it subtends is increased, it may look to you to ‘expand’ on movement. Equivalently, when you retreat, it may look to you to grow smaller or ‘contract’, specifically as a function of the reduction in the visual angle it subtends. Likewise, in encircling it, it may appear to you as though respective sides ‘replace themselves’ so that, to use Husserl’s words, “the sides are joined to one another as continuous... they bring to appearance the closedness of the nexus of the sides and therefore make the complete corporeal surface appear as a “closed” one” (1997, p. 214, §72, lines 30-34). This phenomenology suggests a distinction to Husserl. He suggests that an object or *corporeality* is constituted by these patterns of ‘expansion’ and ‘contraction’, ‘concealment’ and ‘replacement’ – “to be constituted in such a way pertains irrevocably to the essence of a body” (ibid., p. 219, §72, lines 20-21).¹⁶¹ But empty space, in contrast, admits of no such modification – it does not seem, when you move through it, to loom or contract; it does not seem to you to have sides that replace each other on movement.

Consider, for example, the case of the sky.

“If, e.g. the blue of the sky appears as a vault and is thereby interpreted as a body, then this body must indeed have its front and back and its closed surface, which must be constituted in possible transitions, in possible cyclical turnings, etc.” (ibid., lines 17-20)

But we hardly understand what it *means* to suppose that the sky has sides in this sense, and the same is true of empty space. Rather, says Husserl, empty space is the ‘residue’ of visual content which “cannot be accommodated to the yoke of the apprehension of the thing” (ibid., p. 220, §74, lines 6-8). That is to say, empty space

¹⁵⁹ I say ‘appears’ for, as I noted in my preamble, even Husserl is somewhat ambivalent as to whether empty space is seen.

¹⁶⁰ Here ‘looks’ should be read comparatively. Importantly too, given that such claims should be understood as claims about how things look *to a subject*, they are not truth-evaluable. See Martin (2010).

¹⁶¹ See Mulligan (1995), particularly §7.3, and Drummond (1979).

does not seem to you to ‘expand’ and ‘contract’ with the coloured expanses that cue awareness of the presence of objects.

We can cast this thought intuitively: When you approach an opaque object that you are path-connected to, its facing surface subtends a greater visual angle and so may look to you to ‘expand’. Similarly, when you retreat, that angle is reduced and ‘what is left over’ – the visual residue – may look to you to be concomitantly augmented (viz. there is more of it). In both cases, however, the residue itself neither expands or contracts. Still, it is only by seeing the residue, qua *residue*, that you can apprehend the ‘expansion’ or ‘contraction’ that cues the awareness of a *non*-residual material object, one the appearance of which may look to you to change on your movement towards, away from or around it.

Now, in the last chapter I designated episodes of experience that yield such patterns of contraction and expansion *elastic*. And in Chapter Five I defended a related claim; I argued that seeing the boundaries of objects involves seeing qualitative heterogeneity – some *other* positivity outwith those bounds (to use Husserl’s idiom, this other positivity is the ‘visual residue’ that one co-sees with the object). Critically, however, such seeing is *extensional*. So long as one is in conscious perceptual contact with a region where an opaque object is located, together with a visually differentiated region ‘outside’ it – for the purposes of this argument regions that look ‘see-through’ – one sees the boundary of that object. Still, seeing the boundary of the object in this sense is distinct from seeing the object *as* bounded – that is, as a space-taker. I try to bring out the force of this distinction by introducing the Husserlian notion of a foundational relation. First though, a brief refinement:

When I refer to ‘space-takers’ I aim to single out objects that, as I will use the phrase, *have extension* or are voluminous. This is to be distinguished from merely *being extended* or having extent. I clarify this thought by considering a question Antony Quinton raises concerning Descartes’ *res cogitans/res extensa* dichotomy.

Quinton asks in what sense extension functions as the mark of the material for Descartes. He reasons that since various geometric types are in possession of spatial

properties it might be wondered which concept of spatiality Descartes means to deploy so as to mark off *res extensa* from *cogitans*. For example, a point has the property of having position, a line has the properties of both position and size, area has, in addition, shape, while volume has all of these properties plus the property of occupying space. Since all of these are spatial properties, we might ask: Which property does Descartes mean to harness?

	Position	Size 'extent'	Shape	Space- occupancy 'extension'
Volume	✓	✓	✓	✓
Area	✓	✓	✓	✗
Lines	✓	✓	✗	✗
Points	✓	✗	✗	✗

Concepts of spatiality from weak (inclusive) to strong (exclusive)

Quinton’s primary exegetical point is that whatever conception of spatiality Descartes aims to apply to *res extensa*, it ought to apply exclusively, for otherwise it would not be essential to such *res* that they have the relevant property.¹⁶² But the only spatial property that applies exclusively to matter is the property of occupying space (see the table above). This leads Quinton to conclude that “voluminousness or geometrical solidity” is the essential attribute of matter (1964, p. 335). In line with Quinton then, I reserve the term ‘extension’ for objects that have volume - space-takers - while ‘extent’ may apply to phenomena that are *not* three-dimensionally extended, such as this line _____. This much clarified, I return to the primary dialectic and the Husserlian notion of a foundational relation.

When one sees colour, one also sees extent – one cannot see colour without seeing some extent that is coloured. For this reason, Husserl designates the relation between colour and extent as ‘foundational’ – that is to say, there is a formal or internal relation of dependence between them such that *one cannot see one without the other*.¹⁶³

¹⁶² Bernard Williams (1990, p. 124) clarifies this point: “No property which essentially belongs to one thing can non- essentially belong to another. This follows at once in Descartes’ system, because he so uses the notion of an essential attribute that all other properties of a thing with a given essential attribute must be *modes* of that attribute (*Princ.* I 53, 56). Matter or body being essentially extended, all other properties of matter are ways of being extended”.

¹⁶³ An internal relation is one that always holds between its terms Mulligan (2007, pp. 41-42).

Now, *prima facie*, this might appear to contradict the primary claim of this thesis, namely that colourless empty space can be seen. But it seems to me that we can easily renegotiate the insight that colour and extent are foundationally related without undermining this thought. Importantly, the relatedness that holds between colour and extent pertains only to what Husserl calls ‘moments’, dependent parts *of a thing as a whole* (Simons 1982, p. 117, see also p. 124, cf. Mulligan and Smith 1982, p. 41). But this being so, while there *is* a symmetrical relation between colour and *extent* when dependent parts of objects, this need not apply to colour and *extension* (cf. Mulligan 2007, p. 74). This, then, is a happy outcome since although one must see something through an empty region in order to see it (or as I argued in Chapter Seven, one must see empty regions seen through other empty regions as being continuous with those regions seen through), the foundational relation between colour and extent need not entail that one cannot see colourless extension.

Foundational relations, however, are of various species. The relation ‘is a sibling of’ is symmetrically co-founded on relata that are siblings. But unlike this relation, the relation above is *phenomenal* – call it a phenomenal foundational relation. One might think of a phenomenal foundational relation as one whereby experience of one relatum entails experience of the other; where one relatum is phenomenally foundationally related to another, no creature could perceive one and not the other. For example, it is essential to the seeing of colour that extent is co-seen; both are phenomenally foundationally related. How does this notion apply to the co-seeing of empty space and objects?

Consider the case that was detailed in Chapter Six. For M. G. F. Martin, it is essential to experience of bodily sensation as *within* that one is aware of a region outwith the body which one does experience in the same way. Still, it need not be essential to experience of sensation that is of, or pertains to, the body that it is experienced as *bodily*. As Martin writes:

“Suppose we have a creature which has sensations, but has no sense of the contrast between itself and the rest of the world. Would its sensations be like ours? For instance, suppose we have a kind of jellyfish living in currents good enough to move it towards food and away from harm. The jellyfish lacks all sense of its boundaries with

the rest of the world, and has little time for detecting predators... although it has sensations which inform it about its body, it is doubtful whether we should think of it as sensing its body as its body". (1993, p. 211)

Now, above I outlined Husserl's insistence that the perception of objects, unlike the perception of that which is 'outside' them, typically empty space, may be characterised by phenomenology that we can metaphorically describe in terms of patterns of 'expansion' and 'contraction', 'concealment' and 'replacement'. I explained too why seeing this much involves seeing the visual residue or 'what is left over'. But since such seeing is extensional, it thereby follows that whenever one sees the boundaries of objects, one co-sees whatever is outwith those boundaries and, in many perceptual instances, this is simply space that has the look – empty space in a ground sense. Even so, just as there is a difference between experiencing sensation that pertains to the body and experiencing it as *bodily*, there is a distinction between seeing the boundaries which objects *have*, and seeing those objects *as* bounded.

When one perceives the boundaries of objects, one necessarily co-perceives that which is outside them. As such, it might be supposed that such co-seeing is phenomenally foundational. But in contrast, it seems broadly *inessential* that one perceive those objects as bounded. This suggests the grounds for sorting among *two* species of co-seeing in the case of objects and empty space:

The first, the one I believe Husserl means to isolate, is the extensional co-seeing of objects and the visual residue that is left behind when one sees their boundaries – since one sees the boundaries of the relevant object, one co-sees their 'outside', typically space with the look. The second, as I have indicated, involves the co-seeing of objects *as space-takers* and empty space *as space which objects could take up*.

Now, recall that Noë's 'puzzle' starts from the phenomenological datum that we perceive objects as space-takers, despite seeing only their facing surfaces. But if I am correct (and the argument that follows is sound), this being the starting point, there is, after all, no puzzle to begin with: If one sees the empty space 'outside' the surface of an opaque object *as space that an object could take up*, and one sees this space as

continuous with the space that the object occupies, then one sees the object as being three-dimensionally extended while only seeing its facing surface.

I consider this claim in more detail below. First, one final point is worth recognising, one that nonetheless honours the intuition behind the puzzle.

Co-seeing in the former, Husserlian sense seems to involve a *phenomenal* foundational relation in the manner of colour and extent. If one sees a boundary, one cannot fail to see both what is within and without its bounds. But co-seeing in the sense I now aim to explore – the second sense – is *not* phenomenally foundational. Just as it is not essential to the phenomenal experience of the boundaries of objects that one perceive those objects *as* bounded, nor is it essential to perceptual experience of empty space that one perceive empty regions as space that objects could take up. I henceforth designate this second species of co-seeing *non-phenomenally* foundational. It is conditions on this achievement that I now wish to explore.

3.

It is, I claim, a datum that when you see the tomato, you see the empty space around and ‘outside’ it. Moreover, you see the region that the tomato itself occupies as continuous with these regions. But this explains why you see the tomato as voluminous. Because you see the empty space around the tomato as continuous and as having dimensionality, you see it as space that objects could take up. But since you see the region that the tomato itself occupies as continuous with those regions, you thereby see the tomato as a space-taker. I argue that seeing this much involves co-perception in a foundational, albeit non-phenomenal sense.

Since seeing empty space as space that objects could take up involves representing it as continuous and as having dimensionality, an achievement which, as I contend, involves representing objects as space-takers, you cannot see empty space as space that objects could take up without representing objects as three-dimensional – both are co-seen.

Here, and in §4, I defend the claim that objects give significance to the continuity and dimensionality of space.¹⁶⁴

Every place in our world is spatially related, but how perceivers grasp this fact may differ. Some may only grasp it by moving through it, while others may grasp it independently of such movement. In both cases, however, it remains the case that *how* the perceiver grasps the connectedness of space depends on what *use* is made of that grasp – as John Campbell writes: “we cannot ascribe spatial representations to animals in a way that outruns their capacity to give causal significance to the representations” (1994, p. 25). For example, if a subject grasps the connectedness of space by moving through it, then the only way in which that grasp can be put to use *is* by moving through it – movement is constitutive of its grasp. But if a creature can make sense of the connectedness of space independently of his or her movement, then that grasp can be put to use in different ways, ways that need not involve his or her action. Campbell’s thought is that objects have a special role to play in explaining how a creature can come to have a grasp of the connectedness of space in this latter sense.

For example, when an object moves through space – an arrow say – the categorical ground for the continuity of its movement, supposing nothing intervenes, is the continuity of space. For if space were not continuous, if it were interspersed with regions of void, there wouldn’t be the space for it to move through (see Chapter One).¹⁶⁵ Or imagine a marble rolling along a path, if there were holes in the path, it would disappear into their recesses. Hence, seeing the continuity of the marble’s movement is evidence for the continuity of the path on which it is rolling, and the same is true of the movement of the arrow. Seeing the continuity of the movement of an arrow is evidence for the continuity of the space through which it moves, as well as evidence that nothing is present at the regions that it passes through that could interfere with its movement, for example wind or an apple-tree.¹⁶⁶ Importantly,

¹⁶⁴ A large part of the argument that follows may be recognisable in the writings of John Campbell, especially Campbell (1993, 1994a, 1994, 2002).

¹⁶⁵ See Campbell (2002, Chapter 12) for an account of the distinction between dispositions and their categorical grounds.

¹⁶⁶ Campbell notes that other phenomena can be used to register the connectedness of space. He considers a mariner “navigating in vast circuit of tides, whirlpools, eddies and currents” (1994, p. 32), suggesting that the mariner could use these phenomena as a way of registering the connectedness of

however, one can only grasp this much – viz. that the space through which the arrow moves is continuous – if one can also *distinguish objects from their places*. For otherwise there *can* be no appreciation of the movement of the self-same object through a region. It might be asked what the conditions on such an achievement are.

On the face of it, it might be thought that merely tracking the features of objects is sufficient – for example, the colour or shape of the object. As I will explain, however, there are reasons for thinking that something more is needed. Although a subject may represent a particular object at a time by representing particular features that the object *has*, it only represents the object *as distinct from the place at which it is* if it can represent the properties the object has as ‘internally causally connected’. I elucidate the thinking behind this claim.

How an object is at a time is determined by what external factors are acting on the object as well as by factors internal to the object. For example, if an egg falls onto a concrete floor, the shell is likely to crack, and coming into contact with the concrete floor, an external factor, causally explains why – viz. the floor is concrete. But there are factors internal to the egg that are relevant too – the fragility of the shell for example. Indeed, the fragility of the shell, a property of the egg before the fall, is a partial determinant of the way it is now, for had it not been the case that the shell was fragile, it would not have cracked. Campbell supposes that because the condition of objects at a time is not wholly determined by external factors, objects are ‘internally causally connected’. That is to say, if there is some way that an object was at an earlier time that causally determines how it is now, then that object is internally causally connected.

As a way of bringing this notion into view, Campbell offers the following example by way of contrast:

“The pool of light thrown by a projector onto a wall is not causally structured in the way that a physical object is. It is not internally

space. Equivalent phenomena, he suggests, could be used on land – “as when we watch the effects of an earthquake” (p. 33), but “such phenomena are not sufficiently pervasive in our experience to provide the full strength of our grasp of the theoretical significance of the connectedness of the space we occupy”.

causally connected over time, the way the pool of light is at one time does not have its earlier condition as a causal determinant, its condition is determined always by the contemporaneous state of the projector and the surroundings". (1993, p. 8)

So why are objects special?

Objects are not simply property instances; they have more than one property. What's more, though the condition of an object at a time is partially determined by how it was earlier, how it was earlier itself involves a complex of internal properties, themselves inter-related. For example the shell is not only fragile but ovoid, and this explains why it can roll along the ground. But naturally having this disposition depends on the shell being roughly intact, which in turn explains why the shattered egg on the concrete floor no longer has it – the categorical ground for the disposition, that of being ovoid-shaped, no longer exists, and it no longer exists not only due to external factors, including the nature of the floor, but also because of the fragility of the shell. Hence, how an object is at a time, in addition to external factors, depends not merely on factors internal to the object, but on how those factors are (or in the case of the shattered egg were) inter-connected.

Why should representing objects as internally causally connected help give significance to the continuity of space independently of one's movement through it? Campbell's idea is that because objects are internally causally connected, a grasp of this concomitantly allows us to distinguish the external factors that contribute to how an object is at a time from the internal factors or properties which those external factors are apt to act on or affect. I spell this notion out.

When objects move through space, external factors are apt to affect them – namely, whatever it is that occupies the places the object passes through (for example, rain), or indeed fails to pass through (an apple tree). But this means that a grasp of how an object is at a time can help determine how things are *at the place where the object is* (i.e. wet or impenetrable). Moreover, how an object changes over an interval of time can help confer an *order* on how things are at the places that the object has passed through, which in turn explains the current condition of the object and the trajectory it has taken. We may, for example, look to the occupants of the places it has passed

through to explain why it is wet. But likewise, we might look to the absence of objects at places, or as I have argued in this thesis, the shape of space.

So, representing objects as internally causally connected helps sort external factors that are apt to affect the object at a time from internal factors which also determine how the object is at a time (Campbell 1994, pp. 28-29). Hence, if a subject fails to represent objects as internally connected, it cannot sort internal causal determinants from external determinants, even though it may be capable of tracking the object by representing salient properties that the object has – for example its colour or shape. But, as such, without representing objects as internally causally connected, the subject cannot parse objects from their places.¹⁶⁷

Now, so far I have considered how an appreciation of the way in which an object changes over an interval of time can help confer an order on how things are at the places that the object has passed through, as well as give significance to the continuity of the space moved through. How does this compare to cases where the order of places and the continuity of space is given significance through the subject's *own* movement through it?

As pointed out above, if a subject grasps the connectedness of space by moving through it, then the continuity of space can only be registered in terms of the continuity of that movement. Analogously, the only way in which order can be conferred on places is by appeal to the order of experiences had by moving through them (see also Evans 1985, p. 277).

This, then, is distinct from cases in which the movement of objects through space can be used to confer significance on the ordering of places and, attendantly, the continuity of space. We can bring out the force of this distinction when we recognise that, phenomenally individuated, both kinds of experiencers may have indistinguishable experiences. For example, both experiencers may see an opaque object, extensionally construed, fly over a fence; both may see the object and the see-

¹⁶⁷ As Cussins (1992, p. 667) writes: "A placing of features is not a reference to a place of features".

through space around it that it progressively moves through. Even so, there is a difference between the two cases.

In the second case, assuming that the relevant object is represented as internally causally connected, the content of the experience is not exhausted by what is phenomenally given at a time. For when a subject can be credited with such a grasp, it can appreciate that how an object is at a time is a function of *how it was earlier*. But as such, the content of the experience at a time overflows what is phenomenally given – it cannot be reduced to phenomenal experience at a time. Hence, while both subjects may see the empty space that surrounds the object, the subject that fails to represent the object as internally causally connected cannot appreciate the continuity of that space *just by looking* (and perceiving the passage of the object *through* it). Rather such a subject, in order to grasp the continuity of space, must *itself* move. But this being so, such a subject's counterfactual sensitivity to the *emptiness* of empty space is exhausted by *its moving through it*. Such a subject, then, does not see empty space as space where objects could be seen but aren't.

I recap this argument: A subject that cannot represent objects as internally connected cannot parse objects from their places. But since it cannot parse objects from their places, it cannot represent the continuity of space independently of its movement through it. But as such, it cannot represent empty space as space that objects could take up.

Now, as I noted, solutions to the puzzle may likewise seek to augment perceptual content – “likewise” because, as I have said, experiences that represent objects as internally causally connected represent more than is sensorily ‘given’ in experience at a time. But the difference in the account I am urging is that there is no puzzle to begin with, and this just flows from phenomenology.

When one sees the tomato one also sees the see-through space ‘outside’ it. What's more, one perceives this space as having extension and as being continuous with the space that the tomato takes up. But this in turn suggests a reification I ought to make,

one which also explains further at what point the structural and direct theorists may diverge:

When one sees the space that one is in as a sub-part of a larger space that has that sub-region as a part, one sees empty space as continuous, and arguably this explains how one can have a sense, albeit implicitly, of one's sensory limitations - one grasps the fact that there is more to be sensed that is currently being sensed. But as such, one is aware of regions beyond the bounds of sense which are not currently being perceived. Insofar as one is *aware* of them, then, one might say that such regions are not co-perceived, but *co-present* in experience. In *Ideas*, Husserl describes the co-present as a "constant halo" around the field of perception:

"it is not necessary that [...] objects be found directly in my field of perception. Along with the ones now perceived, other actual objects are there for me as determinate, as more or less well known, without being themselves perceived, indeed, present in any other mode of intuition. I can let my attention wander away from the writing table which was just now seen and noticed, out through the unseen parts of the room which are behind my back, to the verandah, into the garden, to the children in the arbour, etc., to all the Objects I directly "know of" as being there and here in the surroundings of which there is also consciousness". (1983, p. 52, §27)

Now, I have argued that a condition on seeing space as continuous is that one represent objects as internally causally connected. But if this is correct, then this suggests that to experience regions outwith the bounds of sense as co-present, one must be able to represent objects as internally connected. If so, this would also explain why one can attendantly see empty regions *within those bounds* as space that objects could take up. In the next section, I clarify the connection between representing objects as internally causally connected and as taking up space. For the moment, consider how far we have come:

As I have argued, there are *two* kinds of co-perception in the case of objects and empty space. In this section, I have focussed mostly on the second – conditions on the perception of empty space as space that objects can take up. If what I have argued in this thesis is correct, however, there could well be subjects which, although they see see-through space and so co-perceive in the first sense, fail to co-perceive in the

second. That is, they fail to see empty space as continuous, and so lack an awareness of regions of space that exist without the bounds of sense. Naturally, then, for such a subject the puzzle does not arise. But, as I am urging, *nor does it arise in the case we are in*. Since we see the space outside the tomato as space that objects could take up – I take this as a phenomenological datum – we also see the region of space that the tomato occupies and which is continuous with those ‘outside’ regions as extended.

4.

So far I have argued that a subject that can represent objects as internally causally connected can appreciate both the continuity of space, and can attribute an order to places, independently of its own movement. In this section I aim to explain why representing objects as internally causally connected involves representing them as space-takers. This, in turn, further clarifies the second species of co-seeing I aim to delineate. First, though, I explain how, in addition to conferring significance on the continuity of space, objects also confer significance on its dimensionality.

It follows from what I have argued above that a subject that merely tracks features can have no counterfactual awareness of places where features could have been but aren’t. For unless the creature can parse the feature from its location, it cannot represent those features as existing at places and persisting through time and so as possibly being elsewhere at some other time. As I have explained, however, because objects are bundles of internally causally connected features, they *can* be parsed from their places. But this explains how objects can give significance to the dimensionality of empty space.

The direction that an object takes at a time is contingent; instead of moving up, an object may have moved down, or to the left say. But naturally an object can only move through space in this way *if there is the space for it to move through*. Since, however, objects *can* move through space in this way – viz. in three dimensions – *when* they move through space, providing, of course, they can be parsed from their places, they reveal its dimensionality.

So why should representing objects as internally causally connected involve representing them as space-takers?

As I have indicated, when one represents an object as internally causally connected one can sort internal from external causal determinants. What's more, one can appreciate that where an object is at a time is contingent – it could have been elsewhere. So treating an object in this way – i.e. as at a place – involves conceiving it as a space-taker.¹⁶⁸

There is, however, a deeper reason as to why being at a place involves taking up space, one that suggests not merely that representing objects as internally causally connected involves representing them as space-takers, but that a condition on representing objects as space-takers is that there are objects that take up space.

Objects have primary properties, where this notion is, as Evans notes, “extremely heterogeneous”. Still, he writes:

“What is important. . . is that the properties constitutive of the idea of material substance as *space-occupying stuff* should be acknowledged to be primary.” (1985, p. 269)

Why should the idea of space-occupying stuff be acknowledged as ‘primary’?

Recall, Quinton had applied an exclusivity criterion to establish that voluminosity or “geometrical solidity” is the essential attribute of matter. Evans, in contrast, has not so much a criterion as an argument as to why. Unlike secondary properties, which are sensory (1985, p. 268), primary properties are non-sensory. And they are non-sensory, because to master the concept of space-occupancy, one must be able to implicitly grasp a set of interconnected principles which make up a *theory* – for example, the conservation of matter in different shapes, how objects compete for occupancy of positions in space, how the resistance of one body may afford the movement of

¹⁶⁸ Consider, by contrast, the case of numbers. We don't conceive of numbers as being capable of being at a place – we don't know what it *means* to suppose that where a number is at a time is contingent, or indeed that it could somehow be affected from outwith. But numbers aren't space-takers.

another, and so on (ibid., p. 269). It is important to recognise the interconnectedness of these principles.

The concept of space-occupancy is *theoretical* inasmuch as it requires a *holistic* grasp of a set of interconnected principles that form a primitive mechanics. But when one grasps the interconnectedness of these, one also grasps the causal interconnectedness of objects. For example, you wouldn't be able to appreciate the principle of the conservation of matter in different shapes if you weren't able to appreciate the identity of some piece of matter, *qua* an object, through time, but nor would you be able to appreciate the identity of an object through time if you couldn't grasp the principle of the conservation of matter in different shapes. But critically, none of this could be grasped or apprehended if there were no objects of which all of the above principles hold, since it is only *through* the causal interconnectedness of objects that the theory *itself* can be organized.

This, then, suggests a further consequence, something that we have noted earlier.

Evans writes:

“it does not appear to be possible to regard the conception of the shape of a material thing – with all the propositions about its characteristic behaviour and interaction with other bodies which that implies – as the same as whatever shape concepts might be grounded in the colour mosaic thought to be given in immediate visual experience”. (ibid., p. 270)

But, after Quinton, we have already observed this much. The shape concepts of *being extended* and *having extension* are distinct. It is hardly surprising, then, that one cannot extract the notion of space-occupancy, which is *theoretical*, from visual experience at a time. As I have noted, when a subject represents an object as a space-taker, that object is represented as internally causally connected. But as such, the content of the experience at a time overflows what is phenomenally given at that time – it cannot be reduced to visual experience at a time. This returns us, once more, to the puzzle.

Since we see the empty space ‘outside’ the tomato as space that objects could take up, and since we see the space the tomato occupies as continuous with those regions, we see the tomato as a space-taker; this is why there is no puzzle to begin with.

Still, as I have urged, we can nevertheless honour the intuition behind the puzzle. Conceiving of empty space as space that objects could take up involves conceiving of objects as space-takers, and conceiving of objects as space-takers involves shape concepts that are distinct from those that might be thought to be grounded in visual phenomenal experience at a time.

Yet importantly, as I have also explained, seeing objects as space-takers and empty space as space that objects could take up is *non-phenomenally* foundational. Hence, there could well be creatures that see empty space without yet seeing it as space that objects could take up.

5.

The position I have advanced in this chapter might be called a ‘no-priority’ view. In both species of co-seeing, there is no seeing of objects without a seeing of empty space – both are co-seen. My final task, then, is to raise challenges for *priority* views; views on which a representation of space is logically prior to a representation of the intrinsic properties of objects, or on which a representation of objects is prior to a representation of space.

1. *The Space-First View*

Against the co-seeing claim, it might be argued that to grasp the dimensionality of objects one has to conceive of space. Here, the thought is that a conception of space is what grounds the ability to conceive of objects as visible from various angles or perspectives.¹⁶⁹ As such, the representation of space assumed is one whereby its

¹⁶⁹ For example, Schellenberg (2007, p. 614) claims that “perceiving intrinsic spatial properties requires that objects are perceived *as perceivable* from points of view other than one’s own”, where this requires that “a subject must have a practical conception of space that involves understanding that there are different possible perspectives on any three-dimensional space-occupier”.

continuity is *already* represented. For otherwise how would one be able to conceive of the region as subsuming the various positions that one could take up so as to view the object from different angles, itself, on this view, a condition on being able to conceive of an object as taking up space? The emphasis, then, is on the priority of the representation of space over the representation of objects *qua* space-takers.

Now, as I have argued, representing space as continuous, independently of the continuity of one's own movement through it, requires, concomitantly, a representation of the internal causal connectedness of objects. This is because when one represents the internal causal connectedness of objects, one can represent a moving object as moving through space over time, and the mere seeing of objects moving through space is not sufficient – not only must one see objects that *are* internally causally connected, *one must represent them as such*; as I have argued, when one represents objects as internally causally connected, one can parse those objects from their places, and so conceive of them, implicitly, as taking up space.

The challenge for the space-first priority theorist, then, is to explain how space can be represented as continuous, independently of the continuity of a subject's movement through it, without making a non-virtuous appeal to space-takers.

2. *The Priority of Objects View*

Unlike the space-first priority theorist, the objects-first theorist might insist that since objects give significance to the continuity and dimensionality of space, objects must be represented prior to representing space. There are, however, empirically motivated reasons to doubt the correctness of this view.

A creature may be able to represent a particular space through its own movement, while nonetheless failing to parse objects from their places. Instead the relevant representation, encoded as a network of paths, may be calibrated using exocentric or geocentric frames of reference – those centred on landmarks, the horizon or stars. There is robust empirical support for such representation,¹⁷⁰ and its philosophical

¹⁷⁰ For an excellent review of empirical neuroscientific work in this area see McNaughton et al. (2006).

significance has been explored by, among others, Campbell (especially Campbell 1993, 1995). But my emphasis is anyway a little different for I have sought to explore conditions not on representing or conceiving of space, but on *perceiving* empty space.

I have argued we can recognise two kinds of co-seeing in the case of objects and empty space. Yet only the second, *non-phenomenal* species of co-seeing requires the representation of objects as space-takers. But as such, if the foregoing is correct, a theoretical space is made in the philosophical literature on spatial experience for a subject whose experience of the world has been so far undertheorised – one that can see empty space, without yet seeing it as space that could be filled

Conclusions

to see through

To continue to watch or take part in (a matter) until the end
(cf. to see out 3 at Phrasal verbs).

- *The Oxford English Dictionary*

I have raised an argument for the visibility of Euclidean empty space, and I have suggested that it has a look – it looks ‘clear’ and ‘see-through’. I have proposed that the intelligibility of such looks claims might be counted as transcendental evidence for our seeing empty space (Chapter Three). In Chapter Six, I set out a broadly parallel argument for tactual awareness, and in Chapter Seven I harnessed these findings to provide a speculative account of seeing space in mirrors.

In addition, I have shown that since empty space has a kind of efficacy that flows from its shape (Chapter Two), it may not, after all, elude the Causal Theory of Perception. Empty regions explain locometrically. What’s more, since the shape of space determines how it appears, the shape of space is genuinely causally explanatory of its appearance, and not in a negatively efficacious way (Chapter Four).

I have also argued against treating the perception of empty space as a species of absence perception, and I have shown in what sense the Direct View I have defended differs from the Structural View, even while, at the level of descriptive phenomenology, they may be reconciled (Chapter Five); we co-see objects and empty space in *both* senses detailed in Chapter Eight.

Notably, however, many of these conclusions flow from the assumption of Absolutism (Chapter One). But to this extent, the Direct View, unlike the Structural View, does not have the advantage of metaphysical agnosticism. Still, since it is possible that Absolutism is true, this, I take it, is not yet a disadvantage.

In particular, the Direct View makes plausible an intermediate case:

On the Direct View, we can grant that subjects that fail to represent objects as space-takers, and those that cannot yet represent the connectedness of space independently of their own movement through it, can nonetheless see empty space. But this being so, perceiving empty space is logically distinct both from representing space as continuous independently of one's movement through it, and from conceiving of it as empty.

Rather, as I have tried to urge, seeing empty space simply involves seeing the see-through space 'outside' objects, and the empty space through which they are seen.

Bibliography

- Armstrong, D.M. 1997. *A World of States of Affairs*. Cambridge: Cambridge University Press.
- Armstrong, D. M. 1999. The Open Door. In *Causation and Laws of Nature*, ed. Howard Sankey. Dordrecht: Kluwer Academic Publishers, pp. 175-185.
- Arnheim, Rudolf. 1948. The Holes of Henry Moore: On the Function of Space in Sculpture. *The Journal of Aesthetics and Art Criticism* 7(1): 29-38.
- Aronson, Jerrold. 1971. On the Grammar of Cause. *Synthese* 22: 414-430.
- Beebe, Helen. 2004. Causing and Nothingness. In *Causation and Counterfactuals* eds. John Collins, Ned Hall and L. A. Paul. Cambridge, MA: MIT Press, pp. 291-308.
- Belnap, Nuel. 1992. Branching Space-Time. *Synthese* 92(3): 385-434.
- Berkeley, George. 1910. *The Principles of Human Knowledge*. London: Kegan Paul, Trench & Trübner & Co. Ltd.
- Bermudez, José Luis. 2000. Naturalized Sense Data. *Philosophy and Phenomenological Research* 61(2): 353-374.
- Block, Ned. 2003. Mental Paint. In *Reflections and Replies: Essays on the Philosophy of Tyler Burge*, eds. Martin Hahn and Bjørn Ramberg. Cambridge, MA: MIT Press.
- Brandom, Robert. 1994. *Making It Explicit. Reasoning, Representing and Discursive Commitment*. Cambridge, MA: Harvard University Press.
- Bricker, Phillip. 1993. The Fabric of Space: Intrinsic Vs Extrinsic Distance Relations. *Midwest Studies in Philosophy* 18(1): 271-294.
- Butterfield, Jeremy. 1984. Relationism and Possible Worlds. *The British Journal for the Philosophy of Science* 35(2): 101-113.
- Casati, Roberto. Forthcoming. Mirrors, Illusions and Epistemic Innocence. In *Perceptual Illusions: Philosophical and Psychological essays*, ed. Clotilde Calabi. London: Palgrave MacMillan.
- Casati, Roberto and Achille Varzi. 1994. *Holes and Other Superficialities*. Cambridge, MA: MIT Press.
- Casati, Roberto and Achille Varzi. 1999. *Parts and Places*. Cambridge, MA: MIT Press.

- Casati, Roberto and Achille Varzi. 2004. Counting the Holes. *Australasian Journal of Philosophy* 82(1): 23-27.
- Chalmers, David J. 1996. *The Conscious Mind: In Search of a Fundamental Theory*. Oxford: Oxford University Press.
- Chalmers, David J. 2006. Perception and the Fall from Eden. In *Perceptual Experience*, eds. Tamar S. Gendler and John Hawthorne. Oxford: Oxford University Press, pp. 49-126.
- Campbell, John. 1993. The Role of Physical Objects in Spatial Thinking. In *Spatial Representation: Problems in Philosophy and Psychology*, eds. Naomi Eilan, Rosaleen McCarthy and Bill Brewer. Oxford: Oxford University Press, pp. 65-95.
- Campbell, John. 1994a. Philosophical Lecture. *Proceedings of the British Academy* 83-3-20.
- Campbell, John. 1994. *Past, Space, and Self*. Cambridge, MA: MIT Press
- Campbell, John. 2002. *Reference and Consciousness*. Oxford: Clarendon Press
- Chisholm, R.M. 1957. *Perceiving: A Philosophical Study*. Ithaca, NY: Cornell University Press.
- Crowther, Thomas. 2009. Watching, Sight and the Temporal Shape of Perceptual Activity. *Philosophical Review* 118(1): 1-27.
- Cummins, Robert. 1983. *The Nature of Psychological Explanation*. Cambridge, MA: MIT Press.
- Cussins, Adrian. 1992. Content, Embodiment and Objectivity: The Theory of Cognitive Trails. *Mind* 101(4): 651-88.
- Cutting, James, E. 1997. How the eye measures reality and virtual reality. *Behaviour Research Methods, Instruments and Computers*. 29(1): 27-36.
- Cutting, James, E. and Peter M. Vishton. 1995. Perceiving Layout and Knowing Distances: The Integration, Relative Potency, and Contextual Use of Different Information about Depth, In *Perception of Space and Motion*, eds. William Epstein and Sheena Rogers. New York: Academic Press, pp. 69-118.
- Dainton, Barry. 2001. *Time and Space*. Chesham, Bucks: Acumen.
- Denkel, Arda. 1996. *Object and Property*. Cambridge: Cambridge University Press.
- Dowe, Phil. 2009. Absences, Possible Causation and the Problem of Non-locality. *The Monist* 92: 24-41.
- Dummett, Michael. 1982. Realism. *Synthese* 52(1): 55-112.

- Dretske, Fred. 1969. *Seeing and Knowing*. London: Routledge & Kegan Paul.
- Dretske, Fred. 1977. Laws of Nature. *Philosophy of Science* 44: 248-68.
- Drummond, John. J. 1979. On Seeing a Material Thing in Space: The Role of Kinaesthesia in Visual Perception. *Philosophy and Phenomenological Research* 40: 19-32.
- Earman, John. 1970. Who's Afraid of Absolute Space? *Australasian Journal of Philosophy* 48(3): 287-319.
- Evans, Gareth. 1985a. Things Without the Mind – A Commentary Upon Chapter Two of Strawson's *Individuals*. In *Collected Papers*. Oxford: Oxford University Press, pp. 249-290.
- Evans, Gareth. 1985. Molyneux's Question. In *Collected Papers*. Oxford: Oxford University Press, pp. 364-400.
- Falkenstein, Lorne. 1998. Hume's Answer to Kant. *Noûs* 32(3): 331-360.
- Fleming, Rowland W., Antonio Torralba and Edward H. Adelson. 2004. Specular reflections and the perception of shape. *Journal of Vision* 4: 798-820.
- Forbes, Graeme. 1987. Places as Possibilities of Location. *Noûs* 21 (3): 295-318.
- Frasca-Spada, Marina. 1998. *Space and the Self in Hume's 'Treatise'*. Cambridge: Cambridge University Press.
- Gale, Richard M. 1976. Negation and Non-being. *American Philosophical Quarterly*, Monograph 10. London: William Clowes & Sons.
- Ganeri, Jonardon. 2001. *Philosophy in Classical India: Proper Work of Reason*. London: Routledge.
- Grice, Paul. 1961. The Causal Theory of Perception. *Proceedings of the Aristotelian Society, Supp. Vol.* 35, pp.121-53.
- Grice, Paul. 1989. *Studies in the Way of Words*. Cambridge, MA: Harvard University Press.
- Hall, Ned. 2002. Non-Locality on the Cheap? A New Problem for Counterfactual Analyses of Causation. *Noûs* 36 (2): 276-294.
- Hooker, Clifford, A. 1971. The Relational Doctrines of Space and Time. *British Journal for the Philosophy of Science* 22(2): 97-130.
- Heider, Fritz. 1959. Thing and Medium. *Psychological Issues* 1: 1-34.
- Hume, David. 1969. *A Treatise of Human Nature*, ed. and with an introduction by Ernest C. Mossner. London: Penguin.

- Husserl, Edmund. 1983. *Ideas Pertaining to Pure Phenomenology and to a Phenomenological Philosophy. First Book: General Introduction to a Pure Phenomenology*, trans. by F. Kersten. In *Edmund Husserl: Collected Works, Volume II*. The Hague, Boston, Lancaster: Martinus Nijhoff Publishers.
- Husserl, Edmund. 1997. *Thing and Space Lectures of 1907*, ed. and trans. by Richard Rojcewicz. Dordrecht: Kluwer Academic Publishers.
- Huston, Hollis. 1978. The Dimensions of Mime Space. *Educational Theatre Journal* 30(1): 63-72.
- Jackson, Frank. 1977. *Perception: A Representative Theory*. Cambridge: Cambridge University Press.
- Johansson, Ingvar. 2004. *Ontological Investigations: An Inquiry into the Categories of Nature, Man and Society*. Frankfurt and Lancaster: Verlag.
- Kalderon, Mark Eli. Forthcoming. Color and the Problem of Perceptual Presence. *Dialectica*.
- Kant, Immanuel. 1992. Concerning the Uitimate Ground of the Differentiation of Directions in Space. In *The Cambridge Edition of the Works of Immanuel Kant: Theoretical Philosophy, 1755-1770*, ed. and trans. by David Walford and Ralf Meerbote. Cambridge: Cambridge University Press, pp. 377-416.
- Katz, David. 1935. *The World of Colour*. London: Kegan Paul, Trench and Co. Ltd.
- Katz, David. 1989. *The World of Touch*, ed. and trans. by Lester E. Krueger. Hillsdale, N.J.: L. Erlbaum Associates.
- Kukso, Boris. 2006. The Reality of Absences. *Australasian Journal of Philosophy* 84 (1): 21-37.
- Leder, Drew. 1990. *The Absent Body*. Chicago: University of Chicago Press.
- Leibniz, Gottfried Wilhelm. 1989. *Philosophical Essays*, trans. by Roger Ariew and Daniel Garber. Indianapolis & Cambridge: Hackett Publishing Company.
- LePoidevin, Robin. 1992. On the Acausality of Time, Space and Space-Time. *Analysis* 52(3): 146-154.
- LePoidevin, Robin. 2007. *The Images of Time: An Essay on Temporal Representation*. Oxford: Oxford University Press.
- Lewis, David and Stephanie Lewis. 1970. Holes. *Australasian Journal of Philosophy* 48(2): 206-212.
- Lewis, David. 1973. Causation. *Journal of Philosophy*, 70 (17): 556-567. Reprinted in *Philosophical Papers*, Volume II, pp. 159-172.

- Lewis, David. 1980. Veridical Hallucination and Prosthetic Vision. *Australasian Journal of Philosophy* 58(3): 239-249.
- Lewis, David. 2004. Void and object. In *Causation and Counterfactuals*, eds. John Collins, Ned Hall, and L. A. Paul. Cambridge, MA: MIT Press, pp. 277–290.
- Locke, John. 1991. *An Essay Concerning Human Understanding*, ed. and abridged by John Yolton. London: J.M Dent & Sons Ltd.
- Martin, C. B. 1996. How it is: Entities, Absences and Voids. *Australasian Journal of Philosophy* 74(1): 57-65.
- Martin, C. B. 1997. On The need for Properties: The Road to Pythagoreanism and Back. *Synthese* 112: 93-231.
- Martin, M. G. F. 1992. Sight and Touch. In *The Contents of Experience*, ed. Tim Crane. Cambridge: Cambridge University Press, pp. 196-215.
- Martin, M. G. F. 1993. Sense Modalities and Spatial Properties. In *Spatial Representation: Problems in Philosophy and Psychology*, eds. Naomi Eilan, Rosaleen McCarthy and Bill Brewer. Oxford: Oxford University Press, pp. 206-217.
- Martin, M. G. F. 2002. Particular Thoughts and Singular Thought. In *Logic, Thought and Language*, ed. Anthony O’Hear. Cambridge: Cambridge University Press, pp. 173-212.
- Martin, M. G. F. 2010. What’s in a Look? In *Perceiving the World*, ed. Bence Nanay. Oxford: Oxford University Press, pp. 160-226.
- Massin, Olivier. 2010. PhD Thesis, *L’Objectivité du Toucher: Métaphysique et Perception*. Université D’Aix Marseille.
- Matilal, Bimal Krishna. 1985. *Perception: An Essay on Classical Indian Theories of Knowledge*. Oxford: Clarendon Press.
- Maudlin, Tim. 1990. Substances and Space-Time: What Aristotle would have said to Einstein. *Stud. Hist. Phil. Sci.* 21(4): 531-561.
- Maudlin, Tim. 1993. Buckets of Water and Waves of Space: Why Spacetime is Probably a Substance. *Philosophy of Science* 60(2): 183-203.
- Mausfeld, Rainer. Forthcoming. The Perception of Material Qualities and the Internal Semantics of the Perceptual System. In *Information in Perception*, eds. L. Albertazzi, G. van Tonder and D. Vishwanath. Cambridge, MA: MIT Press.
- Maynard, Patrick. 1994. Seeing Double. *The Journal of Aesthetics and Art Criticism* 52(2): 155-167.

- MacFarlane, John. 2000. *What Does it Mean to Say that Logic is Formal?* PhD Thesis, University of Pittsburgh.
- McNaughton, Bruce L., Battaglia, Francesco P., Jensen, Ole, Moser, Edvard I and May-Britt Moser. 2006. Path Integration and the Neural Basis of the 'Cognitive Map'. *Nature Reviews Neuroscience* 7: 663-678.
- Mellor, D.H. 1995. *Facts of Causation*. London: Routledge.
- Merleau-Ponty, Maurice. 1968. *The Visible and the Invisible*, trans. by Alphonso Lingis. Evanston: Northwestern University Press.
- Mizrahi, Vivian. 2010. Colour and Transparency. *Rivista di Estetica* 43(1): pp. n/a. (Draft manuscript is available at www.mizrahi.ch, <<http://www.mizrahi.ch/philo/>>. Accessed 24/09/11).
- Möller, E.F. 1925. The Glassy Sensation. *The American Journal of Psychology* 36(2): 249-285.
- Molnar, George. 2000. Truthmakers for Negative Truths. *Australasian Journal of Philosophy* 78(1): 72-86.
- Mulligan, Kevin and Barry Smith. 1982. Pieces of a Theory. In *Parts and Moments: Studies in Logic and Formal Ontology*, ed. Barry Smith. Munich and Vienna: Verlag, pp. 15-109.
- Mulligan, Kevin. 1995. Perception. In *Husserl. Cambridge Companions to Philosophy*, eds. Barry Smith and David Woodruff Smith. Cambridge: Cambridge University Press, pp. 168-239.
- Mulligan, Kevin. 2007. Intentionality, Knowledge and Formal Objects. *Hommage à Wlodek. Philosophical Papers Dedicated to Wlodek Rabinowicz*, eds. T Rønnow-Rasmussen, B. Petersson, J. Josefsson and D. Egonsson. (Available at www.fil.lu.se/hommageawlodek, <<http://www.fil.lu.se/hommageawlodek/>>. Retrieved 10/08/11).
- Mundy, Brent. 1983. Relational Theories of Euclidean Space and Minkowski Spacetime. *Philosophy of Science* 50(2): 205-226.
- Nanay, Bence. 2010. Perception and Imagination: Amodal Perception as Mental Imagery. *Philosophical Studies* 150(2): 239-254.
- Nerlich, Graham. 1979. What Can Geometry Explain? *British Journal for the Philosophy of Science* 30(1): 69-83.
- Nerlich, Graham. 1994. *The Shape of Space*. Cambridge: Cambridge University Press.

- Nerlich, Graham. 2008. Why Spacetime is Not a Hidden Cause: A Realist Story. Paper given at Third International Conference on the Nature and Ontology of Spacetime. (Available at www.spacetimesociety.org, <<http://www.spacetimesociety.org/conferences/2008/Nerlich.pdf>>. Retrieved 10/08/2011).
- Nerlich, Graham. 2009. Incongruent Counterparts and the Reality of Space. *Philosophy Compass* 4(3): 598-613.
- Newmeyer, Frederick (ed). 1998. *Language Form and Language Function*. Cambridge, MA: MIT Press.
- Noë, Alva. 2004. *Action in Perception*. Cambridge, MA: MIT Press.
- Nudds, Matthew. 2001. Experiencing the Production of Sounds. *European Journal of Philosophy* 9(2): 210-229.
- Nudds, Matthew. 2004. The Significance of the Senses. *Proceedings of the Aristotelian Society* 104(1): 31-51.
- Nudds, Matthew. 2009. Recent Work in Perception: Naïve Realism and Its Opponents. *Analysis* 69(2): 334-346.
- Nudds, Matthew. 2010. Sounds and Space. In *Sounds and Perception, New Philosophical Essays*, eds. Matthew Nudds and Casey O'Callaghan. Oxford: Oxford University Press, pp. 69-97.
- Nudds, Matthew. Manuscript. Hearing Things in Time.
- O'Shaughnessy, Brian. 1989. The Sense of Touch. *Australasian Journal of Philosophy* 67(1): 37-58.
- O'Shaughnessy, Brian. 2000. *Consciousness and the World*. Oxford: Clarendon Press.
- Peacocke, Christopher. 1979. *Holistic Explanation*. Oxford: Clarendon Press.
- Pears, D. F. 1976. The Causal Conditions of Perception. *Synthese* 33(1): 25-40.
- Phillips, Ian. 2010. Perceiving Temporal Properties. *European Journal of Philosophy* 18(2): 176-202.
- Pooley, Oliver. 2003. Handedness, Parity Violation and the Reality of Space. In *Symmetries in Physics: Philosophical Reflections*, eds. Katherine Brading and Elena Castellani. Cambridge: Cambridge University Press, pp. 250-280.
- Putnam, Hilary. 1975. Philosophy and Our Mental Life. In *Mind, Language, and Reality*. Cambridge: Cambridge University Press, pp. 291-303.
- Putnam, Ruth Anna. 1969. Seeing and Observing. *Mind* 78: 493-500.

- Psillos, Stathis. 2002. *Causation and Explanation*. Chesham, Bucks: Acumen.
- Quinton, Anthony. 1964. Matter and Space. *Mind* 73(291): 332-352.
- Richardson, Louise. 2010. Seeing Empty Space. *European Journal of Philosophy* 18(2): 227-243.
- Richardson, Louise. 2011. Bodily Sensation and Tactile Perception. *Philosophy and Phenomenological Research*.
- Ryle, Gilbert. 1951. Feelings. *The Philosophical Quarterly* 1(3): 193-205.
- Salmon, W. C. 1993. Causality: Production and Propagation. In *Causation*, eds. Ernest Sosa and Michael Tooley. Oxford: Oxford University Press, pp. 154-172.
- Sanford, David. 1967. Volume and Solidity. *Australasian Journal of Philosophy* 45(3): 329-340.
- Sartre, Jean-Paul. 1969. *Being and Nothingness*, trans. H.E. Barnes. New York: Washington Square Press.
- Savardi, Ugo, Ivana Bianchi, and Marco Bertamini. 2010. Naïve predictions of motion and orientation in mirrors: From what we see to what we expect reflections to do. *Acta Psychologica*. 134(1): 1-15.
- Schaffer, Jonathan. 2000. Causation by Disconnection. *Philosophy of Science* 67(2): 285-300.
- Schaffer, Jonathan. 2004. Causes Need Not be Physically Connected to their Effects: The Case for Negative Causation. In *Contemporary Debates in Philosophy of Science*, ed. Christopher Hitchcock. Oxford: Blackwell, pp. 197-216.
- Schaffer, Jonathan. 2005. Contrastive Causation. *Philosophical Review* 114(3), 327-58.
- Schellenberg, Susanna. 2007. Action and Self-Location in Perception. *Mind* 116 (463): 603-632.
- Schneider, Peter, Jürgen Ehlers and Emilio E. Falco (eds.) 1999. *Gravitational Lenses*. New York: Springer.
- Schumann, F. 1920. Die Repräsentation des leeren Raumes im Bewußtsein. Eine neue Empfindung. *Zeitschrift für Psychologie* 85: 224-244.
- Simons, Peter. 1997. Review of Roberto Casati and Achille Varzi's *Holes and Other Superficialities*. *Philosophy and Phenomenological Research*. 57(3): 734 -736.

- Simons, Peter. 1982. The Formalisation of Husserl's Theory of Parts and Wholes. In *Parts and Moments: Studies in Logic and Formal Ontology*, ed. Barry Smith. Munich and Vienna: Verlag, pp. 113-260
- Slowik, Edward. 2008. Newton, the Parts of Space, and Spacetime Structuralism. Preprint. (Available at www.philsci-achive.pitt.edu, <<http://philsci-archive.pitt.edu/4363/>>. Accessed 10/09/11).
- Smith, Barry and Varzi, Achille. 2000. Fiat and Bona Fide Boundaries. *Philosophy and Phenomenological Research* 60(2): 401-420.
- Snowdon, Paul F. 1990. The Objects of Perceptual Experience. *Proceedings of the Aristotelian Society* 64:121-50.
- Snowdon, Paul. 1992. How to Interpret Direct Perception. In *The Contents of Experience*, ed. Tim Crane. Cambridge: Cambridge University Press, pp. 48-78.
- Sosa, Earnest and Michael Tooley (eds). 1994. *Causation*. Oxford: Oxford University Press.
- Sorensen, Roy. 1999. Blanks. *American Philosophical Quarterly* 36(4): 309-321.
- Sorensen, Roy. 2008. *Seeing Dark Things*. New York: Oxford University Press.
- Sorensen, Roy. 2009. Nothingness. *Stanford Encyclopedia of Philosophy* (Available at www.plato.stanford.edu, <<http://plato.stanford.edu/entries/nothingness/>>. Retrieved 15/09/11).
- Soteriou, Matthew. 2007. Content and the Stream of Consciousness. *Philosophical Perspectives* 21(1): 543-566.
- Soteriou, Matthew. 2011. The Perception of Absence, Space and Time. In *Perception, Causation, and Objectivity*, eds. Naomi Eilan, Hemdat Lerman, and Johannes Roessler. Oxford: Oxford University Press, pp. 181-206.
- Strawson, P.F. 1961. *Individuals*. London: Methuen and Co. Ltd.
- Strawson, P.F. 1979. Perception and its Objects. In *Perception and Identity: Essays Presented to A.J. Ayer with His Replies*, ed. G. Macdonald. London: Macmillan. Reprinted in Newmeyer (ed). 1998, pp. 92-110.
- Taylor, Richard. 1952. Negative Things. *The Journal of Philosophy* 13: 433-449.
- Thompson, Brad. 2010. The Spatial Content of Experience. *Philosophy and Phenomenological Research* 81(1): 146-184.
- Varzi, Achille. 2007. Omissions and Causal Explanations. In *Agency and Causation in the Human Sciences*, eds. Francesca Castellani and Josef Quitterer. Paderborn: Mentis Verlag, pp. 155-167.

- Walton, Kendall. 2003. Depiction, Perception and Imagination: Responses to Richard Wollheim. *The Journal of Aesthetics and Art Criticism* 60(1): 27-35.
- Ward, Dave. 2011. Why Don't Synaesthetic Colours Adapt Away? *Philosophical Studies*.
- Wollheim, Richard. 1980. *Art and Its Objects*. Cambridge: Cambridge University Press.
- Wollheim, Richard. 1998. On Pictorial Representation. *The Journal of Aesthetics and Art Criticism* 56(3): 217-226.
- Wollheim, Richard. 2003. What Makes Representational Painting Truly Visual. *Proceedings of the Aristotelian Society, Supp. Vol. 77*: 131-147.
- Williams, Bernard. 1990. *Descartes: The Project of Pure Enquiry*. London: Penguin Books.
- Williams, Neil Edward. 2005. Static and Dynamic Dispositions. *Synthese* 146: 303-324.
- Wittgenstein, Ludwig. 1997. *Philosophical Investigations*, trans. by Elizabeth Anscombe. Oxford: Blackwell.
- Zahavi, Dan. 2003. *Husserl's Phenomenology*. Stanford, California: Stanford University Press.

Acknowledgements

Since this thesis started life as a thesis in linguistics, my greatest debt is to my primary supervisor Matthew Nudds. I thank him for his extraordinary patience and intellectual generosity, both as philosopher and, in my particular case, teacher. The only sentences that have escaped his scrutiny are these.

I'm grateful too to Jim Hurford for his early encouragement and direction, and for marshalling me towards philosophy. I thank Andy Clark for his characteristic extended-mindedness in thinking a non-philosopher might, after all, have something philosophical to say, and for his supervision and support.

Thanks also go to Richard Shillcock and my colleagues in psycholinguistics, Alasdair Richmond, my second supervisor, for careful and thoughtful comments on various drafts – the first part of this thesis has benefited greatly from his help - and Julian Kiverstein; my first philosophical friend. I thank him for taking the time to explain countless philosophical distinctions, often in the rain.

I'm sincerely indebted also to Kevin Mulligan, both for the opportunity of spending time in Geneva, and for his guidance; I owe numerous references that have found their way into this thesis to him, and that have made it richer as a consequence.

An FCS scholarship made my stay in Geneva possible.

I especially thank, for tea-break interventions, morale-rescuing and the general imparting of philosophical verve: Ana Barandalla Ajona, Olle Blomberg, Fabrice Correia, Rachel Fairnie, Akiko Frischhut, Ghislain Guigon, Nicole Hall-Elfick, David Hawkey, Philipp Keller, Jessica Leech, Anna Marmodoro, Olivier Massin, Lars Marstaller, Anne Meylan, Graham Peebles, Sean Enda Power, Michael Sollberger, Fabrice Teroni, Petra Vetter and Edoardo Zamuner.

Of course, thanks that go beyond this thesis are due to my parents for their unfailing love and support, as well as to my wider family, especially Christina Lynam and John Leach.

Finally, I thank the smallest member of all – Penelope, who arrived between drafts, Sophia Fathima, without whose help the task of producing a final draft would have been more challenging and less enjoyable, and Robert, for seeing me through all of the above and everything else, and for proofreading.